The Mining Journal

Established 1835 — Railway & Commercial Gazette

Vol. CCXLI No. 6172 — LONDON, DECEMBER 4, 1953 — PRICE 8d

There's no escaping it— Wrought Iron is safer

All threats to human safety are not as clearly evident as this one. Many daily dangers are unseen and unsuspected—such as the possibility of failure by couplings, cable chains and cage and lifting gear. *Where equipment of this kind involves the lives of men and women, it is safer to specify Wrought Iron.*

Wrought Iron is very tough indeed. Its shock and strain resistance is outstanding. Its ability to withstand rust and corrosion is well known. And its inherent susceptibility to welding is intensified by slag inclusions. These qualities add up to an all-round, long-term superiority to mild steel for many purposes, in both safety and economy—especially where wet or outdoor conditions are concerned. At the Midland Iron Works we produce Wrought Iron in strips and bars, and in a variety of sections, for innumerable uses. We will gladly send you a free copy of our Section Book, and our technical representative is at your service for consultation on Wrought Iron application.

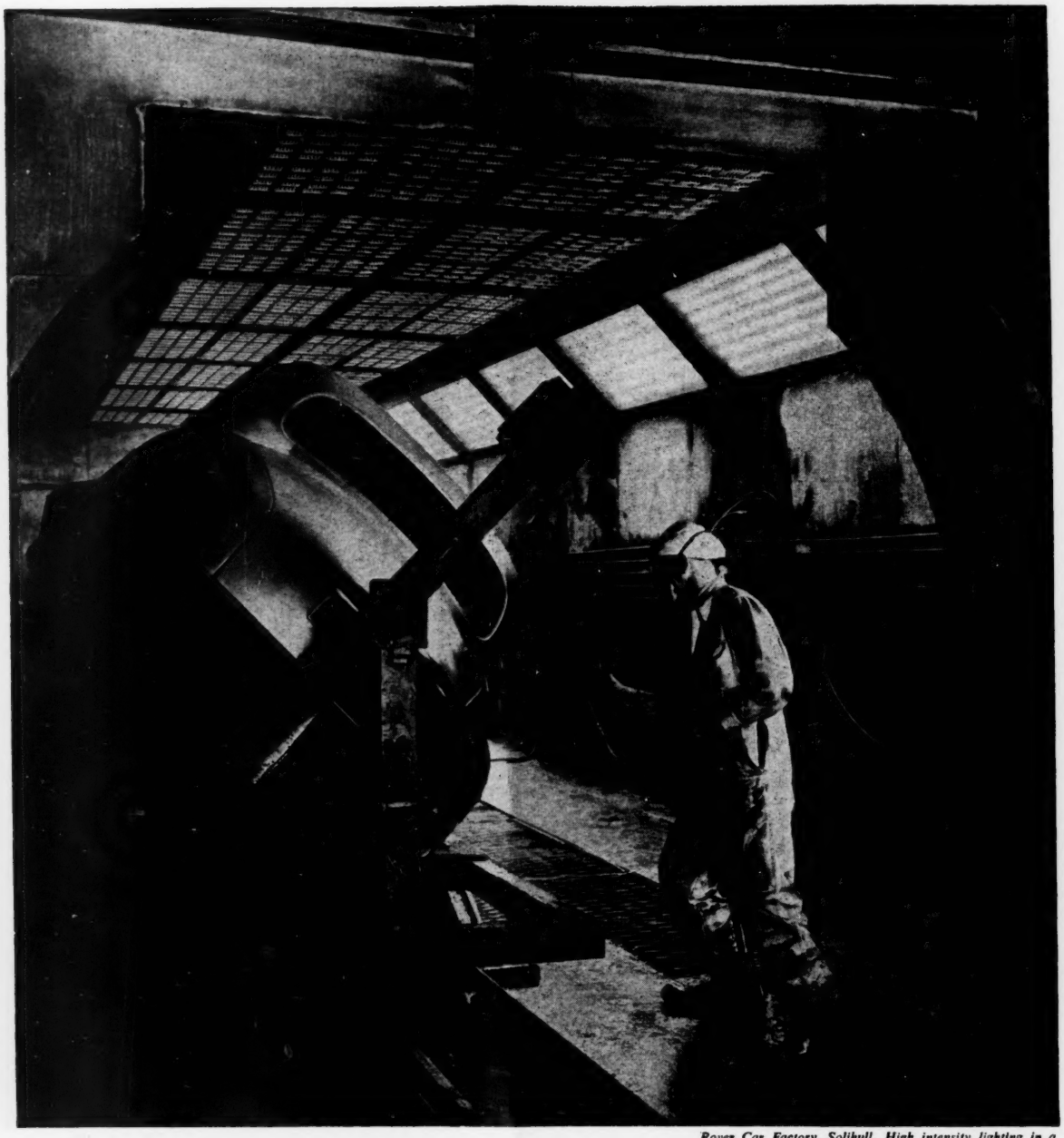
This nick-and-bend test piece clearly shows the fibrous structure of Wrought Iron, which gives it its high durability, shock-resistance and ability to absorb varying stresses and withstand severe vibrations. Wrought Iron is also distinguished by its ductility and exceptionally good machining properties.

The Midland Iron Co. Ltd

MIDLAND IRON WORKS · ROTHERHAM

...you can safely use Wrought Iron for a host of purposes

M1/8



Rover Car Factory, Solihull. High intensity lighting in a body spray tunnel by fluorescent lamps in a glazed enclosure.

Tailored for the job

The lighting of many processes is vital to the smooth and rapid flow of work and to the quality of the finished product. For example, poor lighting could make a spray tunnel into a bottle-neck — each job taking a little too long, a little portion missed, a return to the spray line — and so the whole production line marks time. Whatever form it takes, good lighting not only helps to provide a satisfactory working environment but is an active production tool.

Fluorescent lighting is as good as daylight — only more consistent. It is efficient; it is economical; and it is *flexible*. You can 'tailor' it, easily and exactly, to the special requirements of production at all stages.

HOW TO GET MORE INFORMATION

Your Electricity Board will be glad to advise you on how to use electricity to greater advantage — to save time, money, and materials. The new Electricity and Productivity series of books includes one on lighting — "Lighting in Industry". Copies can be obtained, price 9/- post free, from E.D.A., 2 Savoy Hill, London, W.C.2, or from your Area Electricity Board.

Electricity for PRODUCTIVITY

Issued by the British Electrical Development Association

The Mining Journal

Established 1835

Vol. CCXLI No. 6172 **LONDON, DECEMBER 4, 1953** **PRICE 8d**

CONTENTS

Published by The Mining Journal Ltd., at 15 Wilson Street, Moorgate, London, E.C.2. MONarch 2567 Subscription £2 per annum

NOTES AND COMMENTS

The Nigger in the Stockpile

Whatever may be the outcome of the Geneva Tin Conference, it has at least served to clarify the magnitude of United States stocks. A communiqué was issued from the United States delegation on Saturday last repeating a previous announcement that stocks on hand and under contract would more than fill the U.S. strategic stockpile, and that by next March 38,000/40,000 tons in excess of present requirements would be held. Stocks under control of the U.S. Government comprise a stockpile which has been in existence since the early days of the war (the amount of which has never been disclosed and may be 150,000/200,000 tons or even more), but at any rate is judged a sufficient insurance against all presently foreseeable contingencies. Moreover, purchases effected by the R.F.C. from Indonesia (20,000 tons), the Congo (6/7,000 tons), and Bolivia (10,000 tons), with possibly some minor amounts from countries like Siam, will, Mr. Clarence Nichols says, have yielded 30,000 tons of metal by late March with the balance, 8,000/10,000 tons, to be reduced to metal by next midsummer. No sales from this R.F.C. stock have been made since March last but this supply will be offered for sale to industry in 1954, presumably as part of the operations for winding up the R.F.C.

This announcement appears to have created some consternation among the delegates at Geneva—why, it is difficult to understand, as the figures mentioned accord with earlier announcements of contracts for purchase and there have been repeated statements from Administration quarters of the adequacy of the existing stockpile. It was perhaps hoped that despite this the United States would have added its R.F.C. commitments to the stockpile, or at least indicated releases contingent on the course of the market. The United States contracts have still a year to run in the case of Indonesia, subject to agreement on price, with possibly some further contribution from the Congo and more eleemosynary acquisitions from Bolivia. On the other hand these coming supplies may have to find their way on to the free market. Anyway, the position that the United States will absorb the slack between current world production and consumption can no longer be counted on and if, next year, realization of the R.F.C. stocks is to proceed with reasonable despatch, the outlook for the maintenance of recent price levels appears dim.

Various explanations have been put forward regarding the timing of the present disclosure of the United States holdings outside the stockpile and of their intention to begin disposing of this, coupled with the intimation that considerable portions at least of coming supplies will have to find their own market, thus adding to the excess of production over foreseeable consumption. It has, however, apparently been disclosed that a draft tin agreement has been worked out leaving minimum and maximum prices still to be written in, and it may be that this statement of the United States supply position and sales policy has been emitted by way of warning against any over optimistic price determination. It was stated officially that a buffer pool of 25,000 tons formed part of the project of the International Tin Study Group, but even were this accepted and the finance provided, it does not look as if a buffer stock of this magnitude may prove anything like adequate.

Belt Conveyor Know-How

On another page we publish the first of a series of seven articles dealing with the design and use of belt conveyors in mines. Aside from a standard American work on this subject we know of no text book in English dealing with the ground covered by this series in anything approaching so comprehensive and authoritative a manner. The articles are not written for those engaged in the design, manufacture and installation of belt conveyors to whom this material should already be largely familiar. It is written rather for those who will use the conveyors when installed and as such we believe that the articles will be of lasting value to all those working in mines who use or contemplate using this form of transportation. The value of this series to mining students will, we believe, also be considerable.

The extremely rapid growth in the introduction of belt

conveyors into coal mines and associated industries throughout the world has served to focus attention upon the usefulness of this efficient form of haulage in the metal mining industry. In recent years many large metal mines have adopted belt conveying and it seems reasonable to suppose that belt conveyors will, in due course, become highly competitive in this field with the more conventional systems of haulage now familiar in metal mines.

Progressive improvement in the design of conveyors has culminated in a haulage medium fully capable of living up to the rough usage inevitable in mining and having a very high carrying capacity. Various limitations such as length of flight, excessive belt wear, etc., have to a considerable extent been overcome, and provided that output is sufficiently large to warrant the adoption of a major haulage system, the possibility of using belt conveyors must nowadays inevitably receive consideration.

Minerals Investigations in British Guiana

The recent prominence given to the affairs of British Guiana in this country, invests the report of the Colony's Geological Survey on its operations during last year with more than usual interest. In bauxite mining, the principal activity in the colony's mining field, the chief development was the taking over by the Reynolds Metals Company of the Berbice Bauxite Company's properties when the latter decided to cease all operations. The Demerara Bauxite, subsidiary of Alcan, continues to produce on a great scale and its activities have not been interrupted by the recent strikes. With the existing large reserves the question of seeking fresh deposits is not pressing.

Perhaps the largest amount of interest was shown in the examination of manganese occurrences. The Managing Director of the African Manganese Company, Mr. R. Coward, together with the Company's geologist, Mr. P. K. Hall, investigated discoveries made earlier by Major D. Lewes of the Canadian Barima Gold Mining Company and decided to carry out detailed investigations in the neighbourhood of Arakaka Creek. The manganese ore so far observed is detrital and due to surface enrichment. The company also plan examination of the deposits at Saxacalli in the Essequibo area.

The acute scarcity of colombium minerals led to considerable prospecting activity during the year with three companies active. Kennametal International S.A. was given an exclusive permission to explore 75 acres along the main drainage basin of the Ruming-Rumong river; after the recent disturbances however this company withdrew. The second concern was the Morabisi Mining Company operating along the right bank of Robello creek, a tributary of the Morabisi river. The third concern was the Colombium Corporation working along the left bank of the Morabisi. Up to the time of the report no columbite had been found *in situ* whether in the pegmatites or granite. Generally columbite has a widespread occurrence throughout the area and economically workable concentrations were revealed by the Morabisi Mining Company as a result of intensive prospecting. Similar deposits are looked for in various areas recommended for further search.

The British Guiana Consolidated Goldfields Company worked their new dredge throughout the year just below Tumatumari Falls on the Potaro river with satisfactory results. Dredging of the Mahdia river continued and there was extensive prospecting in the Konawaruk. The Barima Gold Mining Company worked a single bucket pontoon dredge in the Barima river but details of recovery were not available. The New York-Alaska Dredging Corporation decided, on the recommendation of their representative Mr. J. James, to reinvestigate the alluvial deposits of the Quartzstone area on the lower Cuyuni with a view to possible dredging, employing a small percussion drill for testing. Cyanidation of the tailings of the old Peters Mine near the Potaro river ceased and this operation carried on by the Tikwah Mining Corporation was closed down.

Diamond mining, largely in the hands of "pork-knockers," continued much as usual. The prospecting for deposits in the Kurapong river by the Kurapong Placers Co. was finished early in the year, the company having decided that the deposits were not worth large scale exploitation; and attention was then directed to the gravels of the adjacent Eping Basin. Further prospecting of the head waters of the Echerak Creek was recommended where divers are recovering stones from the deep pools of the creek. Further confirmation was obtained for the theory that the diamonds in this area were derived from the conglomerates of the Roriama Formation.

The Belgian Congo

(From Our Own Correspondent)

Brussels, November 25.

The report of the Katanga Special Committee, commonly referred to as the C.S.K., just issued, contains some interesting details regarding the big developments now proceeding in the Western Group of mines operated by the Union Minière. The Katanga Special Committee was originally created in 1900 to administer the lands and mines of the area on behalf of the then Congo Free State, and of the Compagnie du Katanga. Two-thirds of the profits went to the State and the remaining third to the Katanga company. This latter sent out four expeditions, to one of which the Belgian geologist, Jules Cornet, was attached, and he defined the great mineral wealth of Katanga. This area is now the main mining zone of the company centred in Musonoi-Kolwézi. At present all these western mines are being worked open-cast and are shipping some 2,000,000 tonnes of produce monthly.

At Ruwe 200,000 cu. metres are mined monthly, which means 100,000 tons of concentrates coming from the washing plant.

At Kolwézi, a dam is being erected on the Kolwézi river to create a lake containing 1,000,000 cu. metres of water for the concentrator.

At Musonoi, 200,000 tons of cupriferous-cobalt ores are being concentrated monthly from three open-cast workings after four or five times that tonnage has gone into the discard.

At Zilo, the construction of the Delcommune hydro-electric power station is proceeding actively; the top of the dam has reached 67 metres above the level of the Lualaba river, as the Congo is called at this point. The first generator turbo group was put into commission on December 18 of last year.

With the enlargement of the Jadotville plant production capacity of electrolytic cobalt has been increased and 3,321 tonnes were produced as against 2,542 in 1951.

Improvements at the Panda electric smelter enable the production of white alloy resulting from the treatment of the Kengre lead ores to be effected.

At the Lubumbashi smelter a second converter was put into commission resulting in the output of copper being increased to 91,687 tonnes compared with 79,082 in the previous year.

Preparations for working the 400 and 450 levels of the Prince Leopold mines at Kipushi is proceeding and extraction from the 320 and 350 levels continued. Despite the narrowing of the lode in depth output increased by 13 per cent. The Kipushi concentrator was enlarged and further extensions to treat the calc-schistose ores are projected.

Brazil

(From Our Own Correspondent)

Teresopolis, November 19.

The Comtroller's recent order, permitting minerals and certain other products to be exported with 50 per cent of the bills negotiable on the free market, has been revoked. All export bills must now be sold to the Bank of Brazil at the official rate (18.38 cruzeiros to the U.S. dollar and 51.408 to £1). Exporters receive, in addition, a premium of 10 cruzeiros per dollar, or the equivalent in other currencies. The object is to bridge the gap between the internal and external values of the cruzeiro and permit Brazilian products to be sold abroad at international prices.

DRASTIC REVISIONS OF EXCHANGE REGULATIONS

Import regulations have also been drastically altered. The available exchange is divided among five categories of merchandise, according to their relative importance to the national economy, 50 per cent being allotted to Category 1, 25 per cent to Category 2, 15 per cent to 3, and 5 per cent each to 4 and 5. The exchange is sold at auction on the Stock Exchange, importers bidding the premium they are prepared to pay on the official rate. Minimum premiums for the five categories are fixed at 10, 12, 15, 20 and 50 cruzeiros to the dollar, or the equivalent in other currencies. The receipt for the premium entitles importers to the import licence within five days and, on presentation of these two documents, any authorized bank will immediately issue the corresponding exchange, against payment at the official rate.

Category 1 includes: natural mineral fertilizers and coal.

Category 2 includes: mineral raw materials, scrap and semi-finished products; zinc and nickel tubes, pipes and accessories; zinc, nickel, tungsten and molybdenum thread or wire; iron and steel rails and accessories; cast or forged zinc and nickel manufactures; iron and steel cables and springs; nickel and tungsten manufactures.

Category 3 includes: iron and steel bars, rods; copper rods, bars, strip, angles, etc.; non-ferrous metal alloys; coke; copper, aluminium, lead plates and sheets; stainless and seamless steel tubes; iron and steel tubes over 2 in. diameter; copper tubes not over ½ in. diameter; copper wire; copper and aluminium cables; wire gauze; aluminium manufactures; special screws.

Category 4 includes: iron and steel plates and sheet over 6 millimetres thick; corrugated iron and steel sheet and plates.

Category 5 includes: all merchandise not specifically included in other categories.

COBALT

Telegrams from Belo Horizonte announce the discovery of cobalt at Sao Joao del Rei, Minas Geraes. The Department of Mineral Production (D.N.P.M.) is about to install plant in the neighbourhood, at Nazareno, to concentrate uranium and thorium minerals, which abound in the region.

Dr. Avelino de Oliveira, Director of D.N.P.M., confirms that the discovery of cobalt minerals of any importance in Brazil is of recent date. Cobalt, he says, exists in the nickel deposits of Sao José de Tocantins, in Goias, as a component of asbolane (oxide of manganese containing cobalt). Geologists of the U.S. Geological Service and D.N.P.M. found there quantities of black flint, with nickel ore, having 1-2 per cent of cobalt and, prior to the last war, the company then exploiting the deposits shipped ore with 3-5 per cent cobalt to Japan. Cobalt also exists in manganese ores in Minas Geraes, at Usina in Ouro Preto, at Diamantina and Bom Despacho, but their economic importance is unknown. Cobalt has been found, with an average of 1 per cent, in manganese concretions of clay in Sao Paulo and, with 1 per cent also, in the chromite deposits of Campinhas and Pedrinhas, Bahia, where it is mixed with garnierite, or silicate of nickel. These last-named deposits, Dr. Avelino says, are of no economic interest as far as cobalt is concerned.

Professor Mehl also mentions the manganese deposits of Aquidauna, Mato Grosso, as containing a useful percentage of cobalt. He estimates the known Brazilian deposits of cobalt minerals at 80,000 tons, with an average content of 1.5 per cent, and recommends priority for prospecting and exploiting, in view of the world shortage.

Portugal

(From Our Own Correspondent)

Oporto, November 24.

Since your correspondent's last report the world market price for tungsten concentrates, Portugal's main source of mineral wealth, has crashed badly. Exports are now only for material under long-term contracts and after sales which dried up about June or July have been cleared off, only long-term contracts will remain. The anomalies involved in the Government decree of July 3 altering the export duties on tungsten concentrates has now settled itself without any official intervention, as all interest in consuming countries has ceased.

EXPORTS IN SEPTEMBER

Export figures for September are as follows (in tonnes): wolframite 376, tin concentrates 47, cupreous pyrites 20,050, manganese ore 1,524, roasted and leached pyrites 7,150, iron ore 7,658, white arsenic 17. Total shipments for the first nine months of the year are as follows:

	1953	*1952*
Wolframite	2,455	3,133
Tin concentrates	963	1,226
Tin metal	37	180
Cupreous pyrites	213,590	270,428
Roasted and leached pyrites	132,499	235,340
Iron ore	99,107	28,240
White arsenic	955	965

Small parcels of beryl and tantalite/columbite were exported to the U.S.A. Details of these together with precious metal values in the pyrites are only published at the end of the year and should appear in the Government bulletin to be published next February.

It may be of interest to note in regard to wolframite exports that the U.S.A. took 1,623 tonnes and the U.K. 832 and the respective figures for tin concentrates were 849 and 98. The whole of the roasted and leached pyrites went to Germany which also took 35,938 tonnes of cupreous pyrites, other destinations for this latter material being Belgium 79,933, France 52,583, and Holland 35,765 tonnes.

SPANISH EXPORTS BOOSTED

It was of interest to exporters here to read that Spanish exports of tungsten ore are considerably above Portuguese figures, in spite of the fact that Spanish figures are usually below those of its neighbour Portugal. Spain, of course, facilitates exports and does not impose penal export duties, whereas Portugal does; and this fact, together with the long frontier separating the two countries, may explain, in part, the phenomenon of the Spanish export figures.

BELT CONVEYORS—I

Underground Transportation by Belt Conveyor

By A. GRIERSON, B.Sc., A.M.I.Min.E.

This is the first of a series of seven articles dealing with the design and use of belt conveyors in mines. As pointed out elsewhere under "Notes and Comments," the articles are written essentially for the users of this form of transportation, with particular reference to the metal mining industry where the use of belt conveyors remains less general than in coal mines.

Although conveying as a major haulage medium has only come into prominence within the last twenty or thirty years, the practice of conveying by endless belts dates back into the mid-nineteenth century. In a paper to the British Engineering Society in 1868, Lyster, an English engineer, described his work on conveying bulk materials by endless belts which consisted of two plies of canvas with a rubber covering. His first idlers were spool-shaped but were soon replaced by straight wooden idlers because of the extreme wear on the belt occasioned by the flared ends. Lyster was responsible for many of the features still in evidence on present day conveyors.

In America, Webster did a great deal of work on grain conveyors, and in the early 1890's Edison built several cotton belt conveyors for the handling of ore, fitted with continuous skirt boards along the carrying strand in order to maintain the load on the belt. Another great pioneer of belt conveying was Thomas Robins, who was largely responsible for the introduction of the three roll idler set with the consequent increase in belt capacity. His original belts had two or more plies with rubber covers, being replaced by belts having a thicker cover on the carrying run than on the bottom side of the belt. About 1896 Robins introduced the stepped ply belt in which the plies stepped off towards the centre, thus permitting a thicker protective rubber cover in the middle of the belt where greatest wear was concentrated.

Richard Sutcliffe was responsible for the introduction of belt conveyors underground ; the first being installed in 1906. Further refinements to these pioneering conveyors were instituted by conveyor manufacturers throughout the world and so the efficient belt conveyor of the present time was evolved. This may be said to consist of a moving endless belt on which material is placed and is so carried from one point to another. The belt is supported along its length by idlers mounted on the conveyor structure and is driven by a drum. It returns to the driving drum after bending around a terminal drum.

The elements of a belt conveyor are thus :

(1) A belt to carry the material and transmit the pull ;
(2) a driving unit to transfer power to the belt ;
(3) idlers and supporting structure between the terminal drums ; and,
(4) accessories, which include devices for maintaining belt tension, loading and unloading the belt and arrangements for cleaning and protecting the belt.

It is intended in this article to deal with each of these elements in sequence and to give as far as possible some indication of the mechanical features and fundamental principles of belt conveying.

THE CARRYING BELT

The carrying belt is the most important part of the conveyor, and therefore warrants the greatest consideration, for upon the belt depends the horse power that can be transmitted and consequently the capacity and length of the conveyor. In order to adequately fulfil its duties the belt must possess the following qualities : It must be sufficiently flexible to safely bend round the terminal pulleys ; it must have the ability to trough, that is, to conform to the angle of the idler pulleys under its own weight. In addition, it must be possessed of the strength to transmit the necessary tension, and it must have resistance to abrasion.

In mining, the types of belts used for high capacity conveying can be classified as :

1. Rubber Belts.
   (a) Cotton fabric multiply ;
   (b) Solid woven fabric ;
   (c) Cord ;
   (d) Nylon, or other synthetic fibre ; and
   (e) Steel wire re-inforced.
2. Stitched canvas belts.
3. Balata belts.
4. Polyvinylchloride belts.
5. Cable belts.

TYPES OF RUBBER BELTS

Cotton fabric multiply: This is the most popular type of rubber belt, and may for convenience be divided into two components, i.e., the rubber cover and impregnation and the cotton duck fabric.

The function of the rubber cover is to protect the fabric from abrasion and prevent moisture or oil from penetrating to the fabric. The thickness of cover depends on the type of material being carried, and the severity of service. For less abrasive materials the cover may be $\frac{1}{16}$ in. If there are lumps giving some impact effect, the cover should be $\frac{1}{8}$ in. to $\frac{1}{4}$ in. For sand, coke and gravel transportation the cover is normally $\frac{3}{16}$ in. to $\frac{1}{4}$ in., whilst for crushed stone, ores and similar material the rubber cover may be of $\frac{3}{8}$ in. or greater thickness. Where severe wear is experienced, the plies may be stepped to give additional thickness of protective cover. The impregnation serves to bind the plies together and prevent ply separation. In general such belts contain approximately 40 per cent rubber and 60 per cent fabric.

The actual strength of the belt lies in the fabric, which may be of cotton or other suitable material of high tensile strength. Cotton duck is more normally used and is classified according to weight, viz., 28, 32, or 36 oz. grades. These figures refer to the weight of a piece of duck 36 in. long and 42 in. wide. The method of weaving and the cotton used, have an important bearing on the properties of the duck, and the following table shows the maximum and safe working stresses of normal 28, 32 oz. duck, heavier grades being commensurately stronger.

Weight of Fabric (oz.)	*Ultimate tensile stress (warp) (lb./in. width)*	*Safe working stress (lb./in. width)*
28	350	25
32	375	28

As will be seen the breaking stress of cotton duck is approximately 350 - 400 lb. per inch width per ply of fabric. A continued stress in excess of the safe working maximum results in harmful effects to the belt as, under tension, belts are more liable to damage by impact and may be severed at intermediate loading points. Also, a sustained greater

tension in the belt than that advocated induces elongation and may also result in the belt fasteners giving way.

A most important feature in the construction of the conveyor belt is the cementing layer of rubber compound which holds the plies together. This is known as the " friction " and must be manufactured to efficiently perform the functions of holding the plies together under normal running conditions, preventing ply separation when the belt is running round drums owing to the fact that the outer ply will have greater velocity than inner plies, and assisting the belt to trough while giving sufficient resilience to regain its normal flat contour.

NUMBER OF PLIES

The number of plies and the grade depends upon the duty demanded of the belt. As previously mentioned, any belt must possess ability to trough, and a definite relationship exists between number of plies and width of belt in order that natural troughing will result during motion and under load.

Width of belt (ins.)	*No. of plies*	
	Minimum	*Maximum*
16	3	5
20	4	6
24	4	7
30	5	8
36	5	9
42	6	10
48	7	11
60	8	12

The grade and number of plies in a belt influence the diameter of the driving drums and terminal pulley. It will be appreciated that a small diameter pulley or drum, if used in conjunction with a thick belt, will induce ply separation due to the additional stress created in the outer plies by bending effects. Many different rules have been introduced giving the size of drum for any particular belt, and the following table is one purporting to show minimum diameters (in inches) for drums in order to minimize ply separation.

	28 *oz. Fabric*			32 *oz. Fabric*		
Number of plies	*Tandem Drive*	*Single Drum*	*Terminal Pulley*	*Tandem Drive*	*Single Drum*	*Terminal Pulley*
4	24	20	16	30	24	20
5	30	25	20	36	30	24
6	36	30	24	42	36	30
7	42	36	30	48	42	36
8	48	42	36	54	48	42
10	60	48	42	72	60	48
12	72	60	48	84	72	54
14	84	70	60	96	84	72

For heavier duck weights increase diameters depending on number of plies. 32 oz. duck 10 - 15 per cent. 36 oz. - 42 oz. duck 20 - 25 per cent. 48 oz. duck 25 per cent. - 30 per cent.

Whilst the above table gives the theoretical minimum diameters, in practice the drums frequently have a much smaller diameter, lack of space underground often placing limitations upon the size of the drum. As main conveyors are generally of great length, however, the harmful effects of excessive bending are reduced by the fact that any particular section of the belt is only infrequently in contact with the drums.

Solid Woven Fabric: These belts differ from the cotton fabric multiply in that the plies are actually interwoven and thus have no dependence on the adhesive properties of the covering material. Solid woven fabric belts are claimed to give greater strength for less thickness and weight.

Cord : This belt is an evolution of recent years, based on the experience gained by the manufacturers of automobile tyres. The cord belt consists of spaced cotton duck cords embedded in rubber and protected at the top by a breaker strip with thick rubber cover. At the bottom of the belt are one or two plies of heavy duck, providing the necessary transverse strength to the belt. More rubber in the construction of the cord belt gives a greater degree of cushioning, which reduces impact damage and adds to the life of the belt. The advantages of cord belts are :

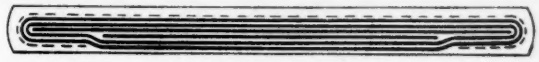
(1) Impact resistance is greater than in multiply belts ;
(2) belt conforms better to idler troughing ;
(3) greater allowable tension as cord imparts high tensile strength ;
(4) reduced stretch after prolonged use ; and
(5) smaller drums can be used.

The following comparison of results obtained in practice between a 7-ply 42 oz. duck belt and a single layer cord belt illustrates some of the foregoing claims. The cord belt was slightly stronger than the multiply and after the test period was found to have stretched only 50 per cent of the elongation of the latter. Troughability was as for a 4-ply. The use of 42 oz. duck belt and smaller drum diameters was possible, this corresponding to the diameter required for a 4-ply belt.

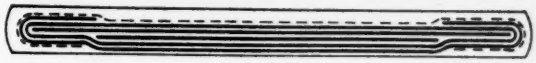
Although cord belts require to be vulcanized this is no imposition, as the results obtained by vulcanizing any type of belt are better than for metal fasteners.

STRAIGHT PLY CONSTRUCTION
Without Breaker Fabric

STRAIGHT PLY CONSTRUCTION
With Breaker Fabric



SINGLE STEP PLY
With Breaker Fabric



DOUBLE STEP FLY
With Breaker Fabric

Types of belting. Note the bottom cover along the edges

Nylon: Nylon belts are claimed at least three times as strong as cotton duck belts of equivalent size and in addition possess better troughability and fastener holding strength. The belt can be joined either by fasteners or it may be vulcanized. Nylon has the advantage of possessing longer flex life; the carcase being up to 30 per cent thinner means bending is easier and hence flex resistance is greater.

Steel wire re-inforced: A further development of the cord belt, the cords in this case being replaced by high carbon steel wire strands. These wires are copper plated and rubber coated in order to provide maximum adhesion to the rubber covers, while the size of the strands and the spacing varies according to the duty expected of the belt. Belt types range from $\frac{3}{64}$ in. spaced 20 per in. up to $\frac{5}{32}$ in. spaced 6 per in. The working tension of the belt ranges from 1,000 to 3,000 lb. per inch width, this being equivalent to 40-120 plies of 28 oz. cotton duck. All the advantages attributed to cord belts are possessed to a greater degree by steel wire re-inforced belts but, as can be expected, the production costs are three or four times as much as those of conventional plied duck belting.

The initial conveyor having this type of belt was installed in 1942 at the Morris Mine in the Mesabi range, U.S.A.

The unit was a 30 in. belt 1,075 ft. in length with a lift of 250 ft. The tension in the belt with this duty was 1,000 lb. per inch width and the fact that the belt stretched only some six inches after four years' use forcibly illustrates the resistance of this type of belt to elongation.

OTHER TYPE BELTS

Stitched Canvas Belts: These are made of plies of cotton fabric, similar to that in conventional belts, with the exception that the plies, instead of being cemented together, are stitched in a machine and afterwards waterproofed. The duck is generally more closely woven than is usual with rubber belting. Waterproofing is effected by means of a compound based on linseed oil or with a mixture of asphalt and various oils. Although the abrasion resistance of the stitched canvas belt is less than that of rubber belts, it is homogeneous and thus can be worn down further. Rubber belts rapidly deteriorate when the covers are worn, and so have a relatively short life. Tensile strength is greater than normal rubber impregnated ply construction, but stitched belts are not particularly suited to mining conditions, especially when operations take place in the presence of water.

Balata Belts: These have a normal multiply construction, but for this type of belt a tree gum called balata is used to impregnate the plies and provide cover. Balata is more resistant to oxidation than rubber, and is stronger but not so elastic. The gum is plastic at 212°F. and softens at 120°F. Consequently balata belts cannot be used for conveying in conditions where high temperatures obtain. The duck used has a close weave and the finished belt lacks the resilience of rubber belts. Balata belts have a very high resistance to water absorption and are well suited for wet conditions.

Polyvinylchloride Belts : All P.V.C. belts have the disadvantage of being a possible source of danger owing to the inflammable nature of their constituents. These belts were fully described in *The Mining Journal* of July 10, 1953. Serious investigation into the possibilities of a non-inflammable conveyor belt was begun some twenty years ago and a degree of success was achieved by the development of a " non-flam." textile webbing belt with a dressing based on chlorinated rubber. This construction, however, had the disadvantage that when the compositions were sufficiently plasticized to give adequate flexibility, deterioration in mechanical properties resulted. Polyvinylchloride, if used with appropriate plasticizers, is a fire-proofing agent.

The two main types of polyvinylchloride belt being developed are the solid woven carcase, impregnated and covered with P.V.C., and the normal multiply construction which has P.V.C. interlayers and covers. Special constructions intermediate between the two are contemplated. Most P.V.C. belts are more susceptible to damage when flexed round small diameter pulleys than are rubber belts, a defect attributed to the stiffness of the carcase. Solid woven P.V.C. impregnated belts are claimed to suffer less damage by such flexing than multiply, and in consequence are more favoured. Joins are effected in solid type belting by means of standard clip fasteners, whilst the multiply may be joined in this manner or vulcanized. Abrasion resistance is high and P.V.C. belts withstand the action of moisture and oils better than rubber belts. They work satisfactorily over a wide range of temperature ranging from —30°C. to 100°C.

Cable: The recent British invention of the cable belt conveyor was fully described in *The Mining Journal* of April 10, 1953. This belt departs from the foregoing types in that the stress is taken by two external steel cables running parallel with the belt. The belt serves only to carry the material and is supported by shoes between the 1 in. diameter steel cables. Being subjected to little stress, the carrying belt need only be of single ply construction protected by rubber. This type of conveyor can be applied on single flights of up to many miles in length.

Mineral Possibilities of Andhra State, India

The Andhra State, India, was inaugurated by Mr. Nehru on October 1, 1953. Situated on the east coast of India and formerly a portion of Madras, the new state is possessed of a variety of mineral resources, of which the following notes give some indication of the commercial and industrial possibility.

Copper ores occur as lenses and veins in trap rocks and quartz veins in certain areas of Andhra. The Nilagham and Salighirry mines near Garimenapenta in the Nellore district contain fairly thick lodes of copper, while other occurrences of copper are found at Agnigundala near Vinukand in the Guntur district, as well as at Gani, Gajjalakonda and Kommemari in Kurnool. Sporadic occurrences of galena and other ores of lead exist in the quartz veins which traverse the country rock in certain parts of Guntur and in the Ceded district, while Kotlur and Nagasanapalle in Cuddappah contain lead ores which in experimental survey have yielded between 70 and 76 per cent lead metal.

Manganese occurs extensively in Vishakapatnam, and large scale extraction operations are being carried out at Garividi, Kodur and Garbham, already established manganese producers. Some 200 tons of manganese were won from the Kurnool district in 1937, but extraction was not continued.

OTHER DEPOSITS

Tests were recently completed on samples of the haematite-quartzite rocks overlying the Vempalle limestone at Chabali in Cuddappah, and these showed an iron content of 54 to 66 per cent. It is estimated that more than 40,000 tons could be exploited from this deposit. Other good iron ore, some thousands of tons in extent, exists at Pagadapalle and at Pendlimarri, while an estimated reserve of approximately 4,000,000 tons is found in the Nallamali range at Velsuriti, Ramalakota and Rangapuram, all in the Kurnool district.

Deposits of coal were known as early as 1891. The seams pass into a river bed and the coal of these deposits has an ash content ranging from 26 to 42 per cent. The ten-mile stretch of country from Lingala to Brahmanpalle contains a particularly clearly marked occurrence of asbestos. Other occurrences are found in Kurnool and Anantapur.

Archaean rocks are found in many districts of Andhra, and are notable for their mica content. The largest formations appear in the Nellore district, and workable quantities occur in pegmatites found in the archaean formations. From Nellore and Udayagiri to Gudur, several mica mines are operating in a strip of country 60 miles in length and 15 miles wide. The majority of these mines provide a good yield of colourless muscovite and biotite. Other mica deposits occur in the Kudia, Krishna and West Godavari districts.

Some 2,000 tons of chromite have been mined in Andhra from Kendapalle, the Krishna district and other places, and graphite and fireclay also occur in the new state, as do limestone, sulphur and pyrites, quartzites and silica sands. Diamond recovery was once extensive in the region, but is now reduced to stray finds following soil erosion caused during heavy rains, although Rayalaseems is believed to contain diamond yielding gravels, particularly around Guntakal. Gold mining operations ceased in 1927 after some 18,000 oz. had been recovered in the twenty-two years following 1905.

The Production and Uses of Beryllium—I.

By A. G. THOMSON

A unique combination of properties renders beryllium metal of considerable value to industry, principally as an alloying element, and although problems associated with its processing have been largely overcome, the metal remains in relatively short supply owing to its limited commercial occurrence. The following article is primarily concerned with the sources of beryllium production throughout the world, while a subsequent and final article will discuss the properties and applications of the metal.

Though beryllium metal was discovered as long ago as 1797, its commercial importance only dates from 1932. The value of this material to industry lies in its unique combination of such desirable properties as light weight, relatively high strength and modulus, good corrosion resistance, and a melting point of 1,500 deg. C. or higher. To these may be added a remarkably low absorption cross-section for neutrons and X-rays, which is of great potential importance to atomic energy programmes. For slow neutron reactors and possibly for intermediate reactors, beryllium is probably the best structural and canning material from the nuclear aspect.[1]

The chief factors limiting usage have been scarcity of ores, high costs of production, and difficulties arising from the brittleness and unworkability of the pure metal. During the past two decades the problems originally associated with processing have been largely overcome. Nowadays the metal can be hot worked readily. It is not yet as soft and ductile for cold working as is desirable, but it is believed that extreme high purity will give a metal of adequate ductility at room temperature, and means to improve cold working are being sought. Meanwhile, sufficient cold forming as well as hot-forming operations can be given to the metal to make it a useful structural material. Large beryllium castings have been successfully produced at the Battelle Institute.

Beryllium cannot be described as a rare element, for its relative distribution in the earth's crust is of the same order as that of arsenic or cadmium, namely 0.005 per cent. Unfortunately the only commercial source is the mineral beryl, which seldom occurs in sufficient quantity to be worked on a large scale, being obtained mainly as a by-product in the mining of felspar and mica. Moreover, the metal content of beryl ore does not exceed 5 per cent and is usually less. Beryl occurs chiefly in coarse-grained pegmatites and occasionally in cavities in granites. A crystal found in Maine, U.S.A., was 18 ft. long, had a diameter of 4 ft., and weighed 19 tons; a few others, almost as large, have been discovered in Namaqualand, South Africa, but such occurrences are quite exceptional.

WORLD OUTPUT

In 1952 the world output of beryl ore rose to an estimated total of 7,000 s.tons, which compares with 5,590 tons for the previous year and 3,200 tons in 1947. Since the war there have been important changes in the pattern of supply. From 1936 to 1950 Brazil alone contributed nearly two-thirds of the total United States imports, Argentina 15 per cent, and the Union of South Africa 7 per cent. Now Africa is coming rapidly to the fore as the principal source of supply. According to figures given in the Paley Report, Brazil—still the largest producer—was responsible for 40 per cent of the estimated world production in 1950. The Union of South Africa, Southern Rhodesia and South-West Africa contributed respectively, 13, 12 and 10 per cent of the total, the United States 8 per cent, and there were also small contributions from Madagascar and Mozambique. Some 46 per cent of the 1950 production came from Africa.

Production in Southern Rhodesia amounted last year to 1,186 tons of ore, compared with 905 tons in 1950; on the other hand, the outputs for South Africa and South-West Africa were lower, being respectively 413 and 591 tons compared with 928 and 725 tons in 1950.

Beryl was first found in quantity in the Bikita tinfield, Southern Rhodesia, in 1949, and this deposit is by far the largest so far discovered, but new occurrences are continually being brought to light. Up to the end of 1951, 1,805 tons had been won from the Bikita tinfield, 188 tons from the Salisbury-Enterprise tinfield, 145 tons from the Miami mica field, and 48 tons from the Mtoko district.

Encouraging results are reported from exploration work on a lithium-beryllium property in Southern Rhodesia, which has been carried out by a subsidiary company of Selection Trust Limited, named Bikita Minerals (Private) Ltd. The property is situated about 45 miles from Fort Victoria. The deposits of lithium-bearing minerals are large and of high grade and there is a considerable tonnage of beryl ore.

The existence of beryl at Ameib and Rossing in South-West Africa, and at Jackalswater, 20 miles north of Steinkopf, in Namaqualand, has been known for many years. Prospecting and exploration have shown that the mineral occurs over a large portion of the Steinkopf Native Reserve and also on both sides of the Orange River valley for many miles. Other occurrences of good quality material have been found in various parts of the Transvaal.

THE U.S. AND SOVIET UNION

Since 1936, the United States has imported over 90 per cent of its total beryllium supplies. In 1952 the U.S. domestic production amounted to 550 s.tons and imports reached 5,500 tons, the corresponding figures for 1951 being 404 tons and 4,316 tons. The estimated reserves of recoverable beryllium are placed at 15,000 tons. It is expected that they can be increased through the discovery of new deposits and the introduction of techniques for utilizing the country's large resources of low-grade ore.

In order to stimulate the expansion of production, the General Services Administration has instituted a purchasing programme for domestically produced beryl ore containing not less than 8 per cent BeO by weight. The programme runs until June 30, 1955, or until 1,500 tons of beryl have been delivered to the depot.

According to Shimkin,[2] metallic beryllium has been produced in the U.S.S.R. at least since 1934. In 1947, standard ingots of 92 per cent purity and experimental lots up to 96 per cent purity were specified. Unfortunately no quantitative data on production has ever been released. In 1947 Soviet technologists were complaining that developed reserves in the U.S.S.R. were inadequate for industry. All the deposits "known to be known" are associated with granitic pegmatites. The most important is located in the Urals, at the great emerald mines of Izumrudnye Kopi.

Among the satellites, North Korea is believed to be a regular producer of beryl and an output of 20,600 tonnes was alleged for 1944. "The figure cited appears very doubtful," comments Shimkin. Finland has resources with a sporadic production of a few tons per year.

Owing to the high fusion point of the metal, and the high vapour pressure at a temperature not much above the fusion point, beryllium has been described as the "World's No. 1 metallurgical headache." One source of difficulty is that, as previously stated, deposits containing beryl ore are

usually worked only when other minerals like felspar or mica are the chief products. In a typical Colorado mine one ton of beryl has been produced for every ton of felspar mined. Richards[3] refers to the development of an automatic method of sorting, which is based on the production of neutrons by beryllium compounds when irradiated with gamma rays of the appropriate energy.

EXTRACTION PROCESS

Recent progress in the extraction of beryllium from the raw beryl has been reviewed by David.[4] Beryl is a silicate of beryllium and aluminium, a typical formula being $Be_3Al_2Si_6O_{18}$. The composition is subject to considerable variation, however, due to the replacement of beryllium by the alkali metals and to alteration by hydrothermal agencies.

The literature generally states that powdered beryl is not attacked by any single acid except hydrofluoric. Consequently, alkaline fluxing is generally resorted to for opening up the raw material, with the accompanying introduction of alkaline metals, which complicate the remaining treatment. Beryllium oxide in powdered raw beryl, however, may be 76 per cent extracted by treatment at 265 deg. C. with dilute sulphuric acid. This is considerably above the boiling point of the acid, and high pressure develops. But if the raw beryl is given a preliminary heating in a rotary kiln to temperatures above 1,000 deg. C., its susceptibility to sulphuric acid is greatly increased. The higher the temperature, the more ready and complete is the reaction. When heated to its sintering point at about 1,450 deg. C., beryl yields 91 per cent of its beryllium on treatment with 56 per cent sulphuric acid at only 250 deg. C. If the beryl is made hotter until melted and then quenched in water, it becomes very reactive with strong sulphuric acid at atmospheric pressure. The melting point of beryl is indefinite and variable, but generally lies between 1,500 deg. C. and 1,600 deg. C., which is well within the range of open-hearth melting. Autoclave treatment with sulphuric acid opens the possibility of utilizing beryl heated only to the sintering point in a cement kiln.

After the ore has been sulphated, it is passed through Dorr leaching machines to extract all soluble sulphates, including those of aluminium, iron and alkali metals, as well as beryllium. The remainder of the process consists of simple evaporation and crystallization with dewatering in sugar centrifugals. Aluminium is crystalized and separated quantitatively as ammonium alum by the use of excess ammonium sulphate in the strong beryllium sulphate mother liquors. It is recoverable in a high degree of purity and may be converted into anhydrous aluminium sulphate or aluminium oxide. The beryllium sulphate recovered by this process is fed into a rotary kiln fired by natural gas and is decomposed to beryllium oxide at a minimum temperature of 1,450 deg. C.

In an improved low temperature process developed by D.E.G.U.S.S.A. (Deutsche Gold und Silber Scheideanstallt), a complex chloride melt ($BeCl_2$ and NaCl in equal proportions) is electrolized, the cathodic product being beryllium flakes. At this stage the metal is about 99 per cent pure. The flakes are pressed hydraulically into briquettes and are melted at 1,400 deg. C. The metal can be vacuum cast, or it can be formed to shape by powder metallurgy techniques, extrusion or rolling, the latter process being carried out in sheaths of other metals. By redistillation in a high vacuum purities exceeding 99.9 per cent may be obtained.

REFERENCES

1. Finniston, H. M. (Atomic Energy Research Establishment, Harwell), *Research* 5, 10, Oct., 1952.
2. " Minerals—a Key to Soviet Power," by Demitri B. Shimkin.
3. Richards, John T., *J. Metals*, May, 1951.
4. David, L. (Beryllium Smelting Co. Ltd., London), *Metallurgia*, June, 1944.

Potentialities of Trepča Mines, Jugoslavia

Trepca mines, the well-known Jugoslav lead-zinc producer, plays a traditional role in the mineral economy of that country. Yet the Trepca wastes are rich in minerals representing a vast potential which hitherto has been unexploited. As *Commercial Information*, from which this article is a condensation, points out, the Trepca smelting plant treats lead concentrates from the majority of mines in Jugoslavia, including Zletovo, Kapaonik, Ajvalija, Novo Brdo, Janjevo, Rudnik, Veliki Majdan, Lece and Suplja Stijena. Besides refined lead (silver, bismuth and zinc chloride) the Trepca mines also produce zinc concentrate for the zinc works of Celje. It will also supply the future zinc electrolysis plant of Sabac with zinc concentrate.

Many other resources and possibilities for commercial operation exist at Trepca. Almost all Jugoslav lead and zinc ore deposits, and especially those of Trepca, are rich in sulphur and iron. The Trepca mine is rich in pyrites and pyrotene, but at present these resources are wasted.

In the flotation processing of the ore, concentrates of lead, zinc and a portion of the pyrites are recovered. The residual pyrites and the entire pyrotene go to waste on the dump. While the lead and zinc and the high quality concentrate utilization coefficient is within the limits of the range achieved elsewhere in the world, the utilization coefficient of the pyrites and pyrotene is very low. These vary between 15 per cent and 30 per cent and the utilization coefficient of sulphur never exceeds 15 per cent of the daily sulphur production. Pyrotene has so far never been used and the entire quantities invariably went to waste. The former partial production of pyrites in Trepca is no longer possible. The pyrites are of poor quality due to the increasing admixture of pyrotene. The Trepca pyrites burn, harden and cannot be transported. They used to be exported but recently they have not been finding buyers abroad or at home so that the production has been almost entirely stopped.

IMPRESSIVE POTENTIALS

The Trepca mines have been operating for over 20 years. The flotation plant currently yields from the Trepca ores alone an average of about 1,500 tons waste daily. This contains about 24 per cent sulphur, 32-34 per cent iron, and 2.5-3 per cent manganese.

It has been suggested that with further treatment approximately 70 to 80 per cent of the total quantities of sulphur, iron and manganese in the waste could be usefully exploited. This would imply that an annual output of 70,000 to 80,000 tons of sulphur or 230,000 to 250,000 tons of sulphuric acid could be obtained; 100,000 tons of iron metal slag, 10,000 to 12,000 tons of manganese and about 50,000,000 kWh. of electric power.

The current output of waste does not represent the ultimate possibilities and resources of Trepca. During its long operating experience, Trepca has been producing annually huge quantities of these raw materials and letting them go to waste, unused. The present reserves of the waste dump are estimated at more than 10,000,000 tons. It is estimated that about 70 to 80 per cent of the waste could be usefully industrially processed. One part, amounting to about 20 to 30 per cent, has been oxidized, cemented and has become unusable; so that about 7,000,000 to 8,000,000 tons of waste would still remain available for treatment. If the current production and the future reserves of Trepca itself be added to these tonnages, it will be appreciated that Trepca has available economically valuable quantities of sulphur and iron.

MACHINERY AND EQUIPMENT

Melting by Electric Furnace

The Lectromelt furnace manufactured by Birlec Ltd. has recently been the subject of the first of a new series of catalogues being issued by that company. The furnace consists of a cylindrical, refractory-lined, dish bottomed shell with three electrodes in triangular spacing projecting vertically through the roof. The shell is mounted on rockers for tilting, and the roof and electrode assembly constructed independent of the shell for swing aside operation. These essentials are allied with special electrical and mechanical features.

The furnace shell is built of heavy steel plate, while the dish-shaped bottom permits inverted-arch construction of the hearth. The roof ring, in which the roof refractories are seated, is a fabricated water cooled steel channel and the electrode masts are securely mounted on the large eye-casting which also supports the roof structure.

Nickel and its range of alloys are advantageously melted in the Birlec Lectromelt furnace, owing to the control of furnace atmosphere and slag composition which makes the arc furnace suitable for this task. In addition, the Lectromelt is used for the melting of copper cathodes and the production of copper wire bars, billets and other shapes. Full control of scrap from all types of charges can be obtained. The equipment is also available for electrothermic processes involving the ores of cobalt, nickel, tin, zinc, lead and other metals.

The furnaces range from the U model of 3 ft. 2 in. shell diameter to the DT of 24 ft. shell diameter. Internal volume of the former model is 5½ cu. ft. and of the latter 3,100 cu. ft. In the U model, nominal size of heat comprises 0.2 tons and in the DT model 110-125 tons, while normal kVA is 200 in the U and 30,000 in the DT. Certain furnaces in the range are available with top-charging roof. All furnaces will show most economical results when operated 24 hours per day and when used to full rated capacity.

A Range of Miners' Lamps

The two types of alkaline accumulators in commercial use are the Jungner of nickel-cadmium and the Edison of nickel-iron, but recently there has been a tendency to use Edison constructional forms with Jungner type active materials. Of the several constructions concerned, the Wolf form, where positive active material is pasted on to perforated and folded nickel foil, is presented by the manufacturers, The Wolf Safety Lamp Co., as serving the double purpose of making the active material conductive and of forming a finished plate which is not liable to distortion, corrosion, or the washing out of essential elements.

In addition to the nickel-cadmium accumulator, the Wolf alkaline miners' hand lamp ranges in size from the 950/K to the 950/EH. The former weighs 6¼ lb., stands 10¾ in. in height, rates 12 amps. per hour and has a discharge rate of 0.6 amps. at 2.5 v. The 950/EH weighs 11½ lb., is 14 in. high, rates 35 amps. per hour, and has a discharge rate of 2.0 amps. at 2.5 v. The 830C alkaline cap lamp is contained in a pressed metal nickelled or bakelite case and is fitted with a safety device which breaks circuit if the cover glass be broken. It has a battery capacity, at rated current, of 18 ampere hours, giving 100 per cent reserve for emergency working.

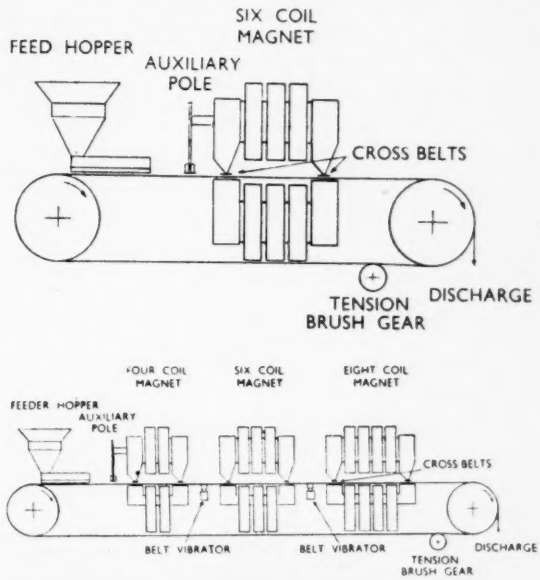
Other additions to this range of miners' lamps are inspection lamps as well as lamp room equipment. The manufacturers' Airtubo lamps 0444/U and 0445/U are approved for use in mines under the relevant regulations.

High Intensity Magnetic Separation

The varying susceptibility of certain minerals to the influence of applied magnetic fields is the basis of the technique of mineral separation by magnetic means. The action of a converging field searches sized ore fed into it and separates magnetics from non-magnetics, while dividing the different magnetic ores one from the other.

Among the magnetic separators currently in use is the Huntington Herberlein High Intensity Magnetic Separator, a machine of the cross belt type designed for the concentration of ores containing feebly magnetic minerals. The standard machine is capable of producing seven products of varying magnetic characteristics and one non-magnetic fraction, and it is stated that its efficiency for the separation of such minerals as wolfram, ilmenite, columbite, siderite and tourmaline and the like from non-magnetic economic minerals such as cassiterite and scheelite has been proved in practice for many years.

In its essential components the separator consists of one to a maximum of three pairs of magnets arranged in increasing strength from the feed to the discharge end. In operation, the ore to be separated is carried in an even and regulated stream on a flat, endless rubber conveyor belt, and particles of ore susceptible to the influence of a magnetic field are attracted to the upper pole pieces. Below at right angles to the feed belt are run cross belts, to the underside of which the magnetic



General principle and arrangement of the high intensity magnetic separator

particles cling until they pass from the magnetic field. The provision of an intensely strong magnetic field permits the use of a deeper layer of feed.

Some typical results obtained with a standard 18 in. Huntington Herberlein high intensity separator are shown on tin "amang." from Malaya containing cassiterite, ilmenite, tourmaline and quartz:

Product	*Weight* %	*Assay* % *Sn*	*Distribution* %
Magnetic fraction ...	66.90	0.10	0.41
Non-magnetic fraction	33.10	49.53	99.59
Feed to separator ...	100.00	16.46	100.00

On tin-wolfram gravity concentrates from Portugal results were:

Product	*Weight* %	*Assay* % WO_3	*Distribution* %
Magnetic fraction ...	12.47	68.62	97.80
Non-magnetic fraction	87.53	0.22	2.20
Feed to separator ...	100.00	8.75	100.00

The magnet support structure permits easy adjustment of individual air gaps ($\frac{5}{16}$ in. to $\frac{1}{8}$ in.), and each magnet consists of a cylindrical core of high permeability steel, and carries a pole piece of similar material at each end. The power requirement of the complete separator is 5 kW. at 110 v. D.C.

A Portable Fluoroscope For Prospecting

A new fluoroscope (Brit. Pat. 696,098), produced from the Research Department of Metropolitan-Vickers Electrical Co. Ltd., depends primarily on the fact that sunlight contains a useful proportion of ultra-violet. A daylight-absorbing but ultra-violet transmitting filter, such as that known as Wood's glass, is used to provide ultra-violet radiation for viewing the fluorescent material in a closed compartment. Fluorescent material then glows at a longer wavelength of visible light, this wavelength being characterized by the nature of the specimen.

In its simplest form the fluoroscope has been made by adapting the Wood's glass flasks used as light-excluding envelopes in the manufacture of the standard mercury-vapour discharge lamps. The neck formed a convenient hand grip without obscuring the bulb, and a rubber eye-guard was fitted around the opening to exclude visible light when viewing. The diameter of the spherical bulb was about 3.5 in., and the thickness of the glass was about 0.03 in. In order to facilitate insertion and extraction of the specimen without contamination of the bulb a removable tray was provided. A more robust model consisted essentially of a steel box about 5 in. cube with a hinged window of Wood's glass. In each case the characteristic fluorescent glow was easily observed when the fluoroscope was activated by normal daylight, thus establishing the basic principle of daylight fluorescent viewing.

Good results were obtained with anthrancine powder, engine oil and vaseline when testing indoors under a skylight or by a window, even on a dull day, but the best results were obtained with direct sunlight. Contrary to expectations, the difference in thickness of the Wood's glass used in the fluoroscopes caused no noticeable difference in the transmission of ultra-violet.

The apparatus may be used anywhere where a reasonable degree of daylight is available, though strong sunlight is preferable. Hence complete independence from electrical supplies can be achieved, but the apparatus may also be used where either metal filament or fluorescent electric lighting is available. The advantages that the new fluoroscope holds for mineralogists, geologists and oil prospectors are obvious.

A New Developing Agent

A photographic developing agent claimed to have excellent properties has been introduced by Ilford Ltd. Named Phenidone, the new agent shares with metol the power of activating hydroquinone, and therefore a Phenidone-hydroquinone mixture forms an active developer.

Phenidone possesses several advantages over metol, of which the most important are that the former functions as an efficient activating agent for hydroquinone at much lower concentrations than are required with metol, and the fact that Phenidone enables active developers to be produced with lower alkalinity than is necessary with comparable metol-hydroquinone developers. In addition, Phenidone is not as readily salted out of solution as metol, it is one of the least toxic developing agents known, and the rate of exhaustion of Phenidone-hydroquinone developers is lower than that of comparable M.Q. developers. Staining is less owing to the ultimate oxidation product of Phenidone being colourless.

Phenidone can be used to replace metol in any existing metol-hydroquinone formula, but is best employed in formulae specially designed to make use of its specific properties.

The B.I.F. in 1955

The Minister of State to the Board of Trade, Mr. D. Heathcoat-Amory, announced this month that responsibility for the British Industries Fair in London is to be transferred to a new non-profit making company, representative of industry, in time to organize and administer the 1955 exhibition. The Government will assist the company by guaranteeing the initial working capital for five years, and the board of the company will be nominated by trustees representative of industry. It is hoped that these trustees will include the T.U.C. and a Government nominee. The Birmingham section will continue to be organized by the Chamber of Commerce of that city, which will have a nominee on the board of the new company.

The 1954 B.I.F. will be organized by the Board of Trade in close collaboration with industry.

REVIEWS

Battery Chargers and Charging, *by Robert A. Harvey, B.Sc. (Eng.) A.M.I.E.E. Published by Iliffe and Sons Ltd. Pp. 400, with 284 illustrations. Price 35s. net. Postage 1s. 2d.*

During the last quarter-century the design of storage batteries has been the subject of steady progress, while fundamental changes have been made in methods of charging and control. This work describes these new methods together with the old methods still in current use, showing how battery control problems have been solved in many industries.

The construction and chemistry of each type of storage battery is first explained and there is a description of the principles of charging. The methods of utilizing these principles in various specialized applications are then described, among which are those principles applicable to the mining industry.

The book will be of interest to those concerned with the installation, operation and maintenance of battery charging systems in any field.

Yearbook of International Trade Statistics, 1952.—*Issued by the Statistical Office of the United Nations. Pp. 384. Price 30s. or $4.0.*

This third issue of the Yearbook shows detailed statistics for 70 countries which together comprise approximately 97 per cent of world trade. For 25 of these countries, which cover about 65 per cent of world trade, the analysis by commodity of imports and exports is made according to the United Nations *Standard International Trade Classification.*

This issue also contains tables showing world trade, according to regions and countries, in U.S. dollars and world and regional quantum and unit value indices of exports.

The dependence of countries on foreign trade is generally greater in 1952 than in 1938, indicating a recovery of foreign trade from its relatively depressed condition in the immediate pre-war period. The Yearbook is available from H.M. Stationery Office, P.O. Box 569, London.

International Tin Study Group, 1953 Statistical Supplement.—*Issued by the Group as a supplement to "The Statistical Year Book, 1952, Tin, Tinplate and Canning." Pp. 91. Free to purchasers of the Year Book and for others, 12s. 6d. or $1.75.*

Almost all the countries covered by the Statistical Year Book, 1952, are included in this supplement, although no information is available on the tin position in the Soviet Union. The supplement brings up to date the statistical material previously published in the Year Book.

Statistics cover all aspects of production and stocks, together with a good percentage of the national production, exportation and the imports of the countries in each continent. Final miscellaneous tables deal with the prices of tin, cans, tinplate, solder and scrap. The value of this volume is enhanced by the present International Tin Conference at Geneva, from which there may emerge some scheme of restricted output.

The Directory of Directors, 1953.—*Published by Thomas Skinner and Co. (Publishers) Ltd. Pp. 808. Price £2 5s.*

The volume under notice, which now has reached its seventy-fourth year of publication lists the directors of all the principal companies in the United Kingdom and of a large number of private companies.

New companies are reported to be formed at the rate of approximately 250 each week, many of which are private concerns, and the directors of a large number of private companies are included in this book. Because of this the edition for this year carries a substantial increase in the number of names of directors. Despite deletions of 5,000 entries the names listed total about 35,000. A most useful volume.

METALS, MINERALS AND ALLOYS

COPPER.—Despite somewhat more confident reports from Santiago regarding the progress of negotiations for the disposal of the copper accumulation there, the market here has tended to drift downwards as was anticipated in our last week's report.

The joint Committee of the Chilean Senate was reported last week to have approved the sale of the accumulated copper at 30 c. per lb. and of future output at the international market price, together with the revision of the taxation and exchange rates affecting the producing companies; a formula for sales to countries other than the U.S. was also discussed. These proposals await the approval by the full Senate, after which negotiations with the U.S. may be resumed. However, there are still a number of details to be worked out and a final disposition of the whole question may still be some distance ahead. Of possible significance is the termination of the strike at Chuquicamata and Potrerillos where work has been resumed after a strike of 51 days, when the strikers accepted the proposals made by the President of the Republic. It is reported from Hamburg that a two-year contract, believed to total 20,000 tons yearly, for the sale of copper derived from the medium and small Chilean producers has been concluded with the Norddeutsche Affinerie as part of the trade pact now being negotiated between West Germany and Chile.

Mr. Heathcoat-Amory stated in answer to a question in Parliament on Monday that there was no serious shortage of copper in the U.K. at present. After the return of copper to private trading it was for consumers to arrange for their own supplies. There was no evidence that copper was being held off the market by producers attempting to squeeze consumers who had hedged. Empire producers had not been asked to give formal undertakings to supply this country after the market opened but they did give formal assurances that they would continue to attend to U.K. needs. In this connection, it may be recalled that the four Copperbelt companies all stated in their recent reports that they had already contracted for the great bulk of their supply to previous consumers during next year. Mr. Amory further said that the Minister of Materials would release copper at a small premium to consumers who had not already covered all their requirements.

LEAD.—Lead prices have eased somewhat this week, probably due to the approach of the Christmas holiday. Otherwise there is little to note. Fairly good purchases are reported from the States, some of this is attributed to enlarging inventories with a view to framing accounts to ease the incidence of taxation.

Hearings before the Tariff Commission in Washington continue, including an important statement from the American Metal Company which, in opposition to previous testimony, advocated subsidies in preference to increased tariffs as a means of overcoming the troubles of American mine owners. Senator Malone, chairman of the Senate Internal Sub-Committee, is reported as saying that President Eisenhower's Advisory Committee on International Policy would probably recommend that main reliance should be placed on imports for supplying the stockpile; and that if this policy persisted the fight in Congress next year would dominate everything else.

TIN.—The optimism displayed on the Metal Exchange recently was rudely shattered by Mr. Nichol's statement at Geneva regarding the size of the tin stocks held by the U.S. Administration Prices on Monday and Tuesday fell some £35 for cash and three months from last week's figure. In the United States prices slumped to 82 c. per lb. on Wednesday and there was general marking down of all futures on the Commodity Exchange. The general tin situation is discussed more at length in " Notes and Comments."

At Geneva an unexpected delay has been experienced in the receipt of replies from various governments on the maximum and minimum world prices proposed for tin, which in view of the United States disclosures of surplus metal is not altogether surprising. Rumour has apparently been busy as to what these limits would be. According to a U.S. source it was said in some quarters in London and on the Continent that the minimum and maximum prices agreed were £700 and £800/£900. Were such figures believed it could well explain Mr. Nichol's cold douche. It was hoped to have had the replies generally available at the end of last month, but now a further delay until December 14 has been requested. Despite the strict secrecy imposed, " leakages " represent various producers including Bolivia, and a number of consumers including France and Denmark as dissatisfied with the proposed levels.

Shipments from Indonesia in October in concentrate form are reported at 2,801 tons of tin compared with 3,681 in September. Shipments for the first ten months were 26,261 tons against 28,717 tons; of the 1953 exports 6,431 tons went to the United States and 19,830 tons to Holland. Straits shipments in November were 5,306 tons, of which 3,483 tons were for the United States, 791 tons for the Continent, 345 tons for the Pacific, 235 tons for South America, 197 tons for India, 66 tons for Australasia, 35 for Africa and 18 for the Middle East. Stocks of tin in all forms in Malaya at the end of October totalled 5,900 tons against 5,555 tons a month earlier. It was announced recently that the British Government intended to grant £6,000,000 in aid to meet the cost of the anti-Communist operations.

United States consumption of primary and secondary tin in September is reported by the Bureau of Mines at 6,855 tons compared with 6,619 tons in August. 33,000 United Steel Workers' Union employees at the American Can and Continental Can Companies' plants struck this week.

ALUMINIUM.—Production of ingots at the Kitimat plant of Alcan is expected to begin next spring. The target for 1954 is 40,000 s.tons of metal. Eventually the capacity will be 550,000 s.tons a year, but the initial capacity will be about 90,000 tons annually.

The Reynolds Metals Company has been demonstrating a new refrigerated and frozen food container consisting of an aluminium foil tray, a board cover and overwrap. They are also marketing a new type of panel of a wide variety of applications, consisting of two sheets of aluminium bonded by heat and pressure to a resin-impregnated paper core.

ANTIMONY.—The U.S. domestic price for antimony was lower at the beginning of the week by 6 c. per lb. to 28.50 c. Here, however, the price is so far unchanged.

TUNGSTEN.—The market here shows indications of a slightly firmer tendency than for the past few weeks, but the only feature to note is a further lowering of the Ministry's selling price to 195s. per unit for wolframite and 180s. for scheelite. In the U.S. the price is reported slightly easier at $28 per s.ton unit nominal—duty extra.

TITANIUM.—The U.S. Senate Interior Sub-Committee has been investigating the titanium situation with the United States Air Force officials largely to the fore. Some rather sensational estimates of future requirements were tendered in evidence. With a current production of a little over 2,300 tons the aircraft industry is said to estimate that it may need some 250,000 tons per year in the future, while another witness agreed with the Air Force estimate that it would require 100,000 tons annually to support the Air Force of the future on a war footing. Earlier the chief of the Air Force Resources Division, General K. D. Metzger, declared that the United States would not be able to produce enough planes to win a war unless the present drastic shortage of the metal was met. It was said that for each of the new fast military supersonic planes some 36,000 lb. of sponge was required. Inevitably, manufacturers and service representatives are not likely to err on the side of modesty in estimating their requirements, but all this testimony indicates that immense expansion in production will take place. The only retarding factor is the working out of some continuous large scale process which will bring down costs of the metal to a commercial basis.

URANIUM.—The Commonwealth Government is to erect a large uranium refining plant supplied by the U.S. Atomic Energy Commission at Rum Jungle. The plant is now being shipped and will, it is hoped, be producing refined oxide within eight months.

GOLD.—The gold output of Colombia is reported in the National Bank Review as 8,385 f.oz. in July, compared with an average of about 35,000 f.oz. monthly for the first six months of the year. This big decline appears to be due to a change in the basis of the statistics. From the middle of July free trading and export of gold was restored, whereas previously all gold had to be sold to the Bank. Consequently it appears doubtful if and when we shall get complete output figures for the Republic henceforward. The output of Western Australia in October was 75,187 f.oz. It is reported that the Russian gold purchase, which was referred to earlier in these notes, has now been completed with some 550,000 f.oz. delivered in London.

PLATINUM.—Refined platinum was reduced in New York by $1 per oz. to $91-93; here there is no change.

Iron and Steel

Business in iron and steel has slowed down considerably but producers are not perturbed. Quiet trade in the weeks preceding Christmas is the usual experience. Many consumers are preparing for the annual stock taking and until that is completed they are keeping down their purchases of material to a minimum. Thus the flow of new orders is considerably less than the volume of deliveries and back logs are being steadily reduced. Nevertheless, confidence is expressed in the development of a brisk revival after the holidays as home industrial requirements are known to be heavy.

The most disappointing feature is the lack of resilience in the export trade. In the face of so many restrictions, and increasingly keen competition, the export drive is making slow progress and the total shipments this year promise to be only slightly better than in 1952. Prices moreover are falling. The price cuts announced by the European Cartel have provoked a storm in the area controlled by the High Authority of the Coal-Steel Pool, and the fiat has gone forth from Luxembourg that the Cartel, which was formed in the spring, must be dissolved forthwith. Meanwhile British steel export prices have also been reduced though the U.K. quotations for sections and merchant bars are still higher than those of Continental exporters. In the case of bars the difference is as much as £4 per ton which is sufficient to account for the lack of foreign trade.

Whether the time is at hand for the lowering of home price levels is a moot point. Possibly there may be a further review of costs of production after the turn of the year. This is a matter upon which the Minister of Supply, acting on the advice of the Iron and Steel Board, is the supreme authority and all contracts are governed by the customary rise and fall clause.

In the meantime, order books are well filled, most of the plants are working to capacity and a high rate of production is sustained by ample supplies of raw materials.

The London Metal Market

(From Our Metal Exchange Correspondent)

As foreshadowed in last week's article the rapid rise in the tin price was not maintained, and the level has fallen even more rapidly than it rose. The main item of news which brought about this reversal was the announcement by the Americans that by March of next year they would have some 40,000 tons of tin in excess of stockpile requirements, and the veiled implication that this tonnage would have to be liquidated at some time or another. It is felt that the timing of the announcement can be taken as indicating that real progress is being made at Geneva, as it is inconceivable that the Americans would be likely to enter the world market as an active seller of tin in view of the present political conditions in the main producing countries. As could be expected, consumer interest is now limited strictly to replacement requirements, but these are on a scale sufficient to steady prices around the lower level now reached. On Thursday morning the Eastern price was equivalent to £637 per ton c.i.f. Europe.

The lead market has developed a weaker undertone, probably due to fears that fair tonnages of nearby metal may be delivered on the Exchange. It is doubtful, however, whether this will affect the position for more than a few days, as demand for prompt lead is still good, and the tonnage of physical metal becoming available during the next two months is unlikely to be sufficient to relieve the present position, which is still giving rise to the payment of substantial premiums for metal for prompt delivery.

The zinc market has been inactive and featureless.

In copper the backwardation has narrowed and a little more interest has been shown in forward metal, but on the whole the undertone is weaker and a further recession of several pounds would not surprise anyone. It is difficult to predict whether the present decline is the initial stage of a general movement to lower levels or whether it is only a repetition of the relatively narrower fluctuations which have been taking place since the market became established, but there is no doubt that demand on the Continent is still good and numbers of consumers in this country must be reaching a point at which they will have to consider doing some serious buying. The Chilean situation remains unresolved, although activity seems to be taking place in several directions to fix up contracts for relatively minor tonnages produced by some of the smaller companies.

Closing prices and turnovers for the week are given in the following table:—

	November 26		December 3	
	Buyers	*Sellers*	*Buyers*	*Sellers*
Tin				
Cash	£657½	£660	£627½	£632½
Three months	£647½	£650	£615	£617½
Settlement	£660		£630	
Week's turnover	570 tons		585 tons	
Lead				
Current month	£92¼	£93	£91¼	£91½
Three months	£90	£90¼	£89⅛	£89⅜
Week's turnover	3,000 tons		5,225 tons	
Zinc				
Current month	£73	£73¼	£74½	£74⅝
Three months	£73	£73¼	£74⅛	£74⅜
Week's turnover	6,750 tons		3,675 tons	
Copper				
Cash	£235¼	£236	£233	£233½
Three months	£225½	£225¾	£224	£224½
Settlement	£236		£233½	
Week's turnover	3,925 tons		5,025 tons	

OTHER LONDON PRICES—DECEMBER 3

ANTIMONY

English (99%) delivered, 10 cwt. and over .. .. £210 per ton
Crude (70%) .. .. .. £200 per ton
Ore (60% basis) .. .. .. 22s./24s. nom. per unit, c.i.f.

NICKEL

99.5% (home trade) .. .. £483 per ton

OTHER METALS

Aluminium, 99·5% £150 per ton
Bismuth (min. 4 cwt. lots) 16s. lb.
Cadmium (Empire), 13s. 10d./14s. 4d. lb.
Chromium, 6s. 5d./7s. 6d. lb.
Cobalt, 20s. lb.
Gold, 248s. f.oz.
Iridium, £60 oz. nom.
Magnesium, 2s. 10½d. lb.
Manganese Metal (96%-98%) £225/£262
Osmiridium, £40 oz. nom.
Osmium, £65/£70 oz. nom.
Palladium, £7 15s./£8 10s. oz.
Platinum, £27/£33 5s.
Rhodium, £42 10s. oz.
Ruthenium, £25 oz.
Quicksilver, £61 15s. ex-warehouse
Selenium, 30s. 6d. nom. per lb.
Silver 74d. f.oz. spot and f'd.
Tellurium, 15s./16s. lb.

ORES, ALLOYS, ETC.

Bismuth .. .. 65% 8s. 6d. lb. c.i.f.
60% 8s. 3d. lb. c.i.f.
Chrome Ore—
Rhodesian Metallurgical (lumpy) £14 8s. 0d. per ton c.i.f.
" " (concentrates) £14 8s. 0d. per ton c.i.f.
" " Refractory £14 0s. 0d. per ton c.i.f.
Baluchistan Metallurgical .. £15 19s. 6d. per ton c.i.f.
Magnesite, ground calcined .. £26 - £27 d/d
Magnesite, Raw .. .. .. £10 - £11 d/d
Molybdenite (85% basis) .. 102s. 4d.-103s. per unit c.i.f.
Wolfram (65%) .. .. .. World buying £185-£195
" " .. .. .. 195s. nom. U.K. Selling
Scheelite .. .. World buying £170-£180
" .. .. 180s. nom. U.K. Selling
Tungsten Metal Powder .. .. 17s. 6d. nom. per lb. (98% Min. W.) (home)
Ferro-tungsten .. .. .. 14s. 6d. nom. per lb. (home)
Carbide, 4-cwt. lots .. .. £35 13s. 9d. d/d per ton
Ferro-manganese, home .. .. £52 10s. 0d. per ton
Manganese Ore Indian c.i.f. Europe (46% - 48%) .. .. .. 7s. 11d. - 8s. 4d. per unit
Brass Wire .. .. .. 2s. 5½d. per lb. basis
Brass Tubes, solid drawn .. 1s. 10d. per lb. basis

THE MINING MARKETS

(By Our Stock Exchange Correspondent)

Stock markets had rather a mixed week. United Kingdom issues began very quietly with the threat of the engineers' strike on Tuesday hanging over their heads. It is estimated that this will cost the country something in the neighbourhood of £10,000,000. Gilt-edged remained steady. The Exchequer deficit for last week was considerably less than for the corresponding period last year and the overall deficit to date is now some £123,000,000 less than for a similar period in 1952. A further feature was the arrival by air of a big consignment of Russian gold, valued at some £5,500,000. It is believed that this is for sale against sterling. It will prove a welcome addition to the country's hard currency reserves. Britain's gold and dollar reserves also rose £14,600,000 in November and now stand at their best level since September, 1951.

Kaffirs again attracted favourable attention although there was a tendency to boil over towards the end of the week. Interest was almost entirely confined to uranium producers and potential producers. The more popular finance houses showed good gains, particularly Strathmore, Consolidated Goldfields, West Witwatersrand Areas and Witwatersrand Mines. These are now beginning to reap the benefit of years of patient work. Many of the older mines, which are solely gold producers, were completely neglected. Strong buying came in, however, for Randfontein, Luipaardsvlei, and Vogelstruisbult on these mines' uranium prospects. The last named made up lost ground after neglect by investors in recent weeks.

The November Rand returns were rather mixed and in some cases definitely disappointing. Doornfontein turned in an initial profit figure for its first month's work amounting to some £6,500. The market considered this very satisfactory as it will be some time before full production can be attained. Dominion Reefs (Klerksdorp) is now becoming a uranium producer. It is not so long ago that this mine gave three months' notice of closure. Following the news, the shares touched a record level of 15s., indeed a case of saved by the gong.

In the Orange Free State there was little of note to report. The better tone was felt here also and market leaders went ahead with the exception of the Freddies group. High expenditure and difficult mining conditions have held these back. St. Helena and Western Holdings produced better monthly figures and there have also been unconfirmed rumours that the former mine may join the uranium list. The returns from Welkom, which showed no improvement, disappointed the market.

Coppers were dominated by the easier metal price and to some extent by the resumption of work in Chile after the strikes. Bancroft and Selection Trust were two bright spots.

Tin shares finished better despite the reaction in the metal price. The United States expects to have a surplus of some 40,000 tons above stockpile requirements by March, 1954. The Geneva conference continues and it is reported that producers and consumers have failed to agree on the price range. A compromise solution, however, has been submitted to the various governments interested. Malaya expects a cut of some 20 per cent in the Federation's exports of tin next year. This may go some of the way towards curtailing surplus production. Temoh Tin are making a capital return of 10s. a share to stockholders. Ipoh rose in sympathy. Nigerian mines were again mostly better. Bisichi were steady on the maintained tin and columbite production figures. Gold and Base Metal Mines turned harder, but Jantar, after rising to 9s., fell back again despite the fact that they are now on a 16 per cent yield basis. Mawchi rose very sharply to 10s. on the news of the occupation of the property by Burmese Government troops. Staff, mine, and power plant are reported to be unharmed.

Leading shares in the lead/zinc market were mostly better. This was achieved despite the easier tendency in the lead price. Burmah Mines in this group rose on the better news from the Union. Consolidated Murchison jumped following reports of resumed sales of antimony, but lack of confirmation caused a setback. Wankie Ordinary were the turn better. The debentures are now changing hands at 99 per cent. A small premium over the issue price.

	Price Dec. 2	+ or — on week
FINANCE		
African & European	2 7/32	+ 1/32
Anglo American Corpn.	5 11/32	+ 1/8
Anglo-French	17/6	.....
Anglo Transvaal Consol.	20/-	+ 7½d
Central Mining (£1 shrs.)	28/-	+ 1/-
Consolidated Goldfields	49/3	+ 2/9
Consol. Mines Selection	26/3	+ 1/3
East Rand Consols	3/-	— 1½d
General Mining	3¼	+ 1/16
H.E. Prop	36/10½	+ 7½d
Henderson's Transvaal	7/9	+ 3d
Johnnies	48/9	.....
Rand Mines	3 3/16	+ 1/16
Rand Selection	31/3xd	.....
Strathmore Consol.	33/1½	+ 4/4½
Union Corp. (2/6 units)	26/-	+ 1/3
Vereeniging Estates	3 1/16	.....
Writs	32/6	+ 1/6
West Wits	43/1½	+ 1/10½
RAND GOLD		
Blyvoors	36/9	— 6d
Brakpan	9/3	— 6d
City Deep	15/-	— 6d
Consol. Main Reef	15/6	— 1/6
Crown	32/6	.....
Daggas	3 1/16	+ 1/16
Doornfontein	26/-	+ 1/3
Durban Deep	34/4½	.....
E. Daggas	13/6	.....
E. Geduld .. (4/- units)	27/6	— 1/3
E. Rand Props	2 11/32	— 1/32
Geduld	3 1/16	.....
Govt. Areas	11/9	.....
Grootvlei	20/6	— 3d
Libanon	9/6	.....
Luipaards Vlei	22/6	+ 1/6
Marievale	18/-	.....
Modderfontein East	15/-	.....
New Kleinfontein	16/10½	.....
New Pioneer	18/6	+ 1/6
Randfontein	55/-	+ 2/6
Robinson Deep	10/6	— 3d
Rose Deep	13/1½	+ 1½d
Simmer & Jack	4/6	.....
S.A. Lands	19/6	+ 3d
Springs	3/9	— 3d
Stilfontein	26/10½	+ 7½d
Sub Nigel	39/4½	.....
Van Dyk	5/3	.....
Venterspost	14/3	— 6d
Vlakfontein	13/-	.....
Vogelstruisbult	34/-	+ 2/-
West Driefontein	6½	+ 1/32
W. Rand Consolidated	2½	.....
Western Reefs	2 3/32	+ 1/32
O.F.S.		
Freddies	8/9	+ 3d
Freddies N.	8/3	.....
Freddies S.	8/1½	+ 1½d
F. S. Geduld	2½	— 1/16
Geoffries	14/3	+ 1/-
Harmony	26/3	+ 9d
Loraine	8/4½	+ 10½d
Lydenburg Estates	12/-	+ 6d
Merriespruit	8/-	+ 6d
Middle Wits	14/6	+ 1/6
Ofsits	36/10½	+ 1/6
President Brand	28/6	+ 3d
President Steyn	21/-	+ 9d
St. Helena	15/3	+ 1/10½
Virginia Ord.	11/10½	+ 7½d
Welkom	17/9	+ 3d
Western Holdings	3 3/32	+ 1/16
WEST AFRICAN GOLD		
Amalgamated Banket	1/8½	— ½d
Ariston	5/9	.....
Ashanti	20/6	+ 4½d
Bibiani	5/-	.....
Bremang	2/1½	.....
G.C. Main Reef	3/4½	.....
G.C. Selection Trust	6/3xd	— 1½d
Konongo	2/4½	+ 3d
Lyndhurst Deep	1/-	+ 1½d
Marlu	1/6	.....
Taquah & Abosso	2/6	.....
AUSTRALIAN GOLD		
Boulder Perseverance	2/6	.....
Gold Mines of Kalgoorlie	13/6	+ 6d
Great Boulder Prop.	8/6	— 3d
Lake View and Star	14/-	— 1½d
Mount Morgan	17/4½	— 1½d
North Kalgurli	6/6	.....
Sons of Gwalia	5/6	.....
South Kalgurli	6/7½	— 1½d
Western Mining	11/-	+ 1½d
MISCELLANEOUS GOLD		
Cam and Motor	9/3	— 1½d
Champion Reef	4/6	.....
Falcon Mines	7/-	— 1½d
Globe & Phoenix	21/9	.....
G.F. Rhodesian	5/3	+ 4½d
London & Rhodesian	4/7½	.....
Motapa	1/10½	+ 3d
Mysore	3/9	.....
Nundydroog	5/7½	.....
Ooregum	3/3	— 3d
Oroville	11/6	.....
MISCELLANEOUS GOLD (contd.)		
St. John d'El Rey	22/9	— 6d
Zams	30/6	— 3d
DIAMONDS & PLATINUM		
Anglo American Inv.	4 7/32	+ 1/32
Casts	20/9xd	— 3d
Cons. Diam. of S.W.A.	4½	.....
De Beers Defd. Bearer	66/9	+ 9d
De Beers Pfd. Bearer	16	— ½
Pots Platinum	8/6	+ 9d
Watervaal	13/-	.....
COPPER		
Chartered	52/3	— 1½d
Esperanza	7/1½	— 1½d
Indian Copper	3/10½	.....
Messina	3½	— ½
Nchanga	6 3/32	.....
Rhod. Anglo-American	48/9	.....
Rhod. Katanga	14/4½	— 4½d
Rhodesian Selection	13/10½	— 3d
Rhokana	18 1/8	— 1/8
Rio Tinto	20	— ½
Roan Antelope	13/6	— 4½d
Selection Trust	34/4½	+ 1/10½
Tanks	58/3	.....
Tharsis Sulphur Br.	42/6	.....
TIN (Eastern)		
Ayer Hitam	23/9	+ 9d
Bangrin	8/-	.....
Gopeng	8/-xd	+ 1½d
Hongkong	6/-	+ 4½d
Ipoh	15/7½	+ 1/3
Kamunting	8/9	+ 4½d
Kepong Dredging	4/3	+ 3d
Kinta Tin Mines	10/3	.....
Malayan Dredging	25/9	— 3d
Pahang	12/3xd	.....
Pengkalen	8/-	.....
Petaling	7/10½	— 4½d
Rambutan	10/6	.....
Siamese Tin	7/9	— 3d
Southern Kinta	13/1½	+ 1½d
S. Malayan	24/3	.....
S. Tronoh	7/3	.....
Sungei Kinta	10/-	.....
Tekka Taiping	4/6	+ 1½d
Tronoh	22/-	+ 9d
TIN (Nigerian and Miscellaneous)		
Amalgamated Tin	11/6xd	+ 1½d
Beralt Tin	20/-	.....
Bisichi	4/7½	+ 3d
British Tin Inv.	13/1½	+ 3d
Ex-Lands Nigeria	3/6	.....
TIN (Nigerian and Miscellaneous) contd.		
Geevor Tin	9/7½	.....
Gold & Base Metal	3/-	+ 1½d
Jantar Nigeria	8/7½	— 1½d
Jos Tin Area	11/9	.....
Kaduna Prospectors	2/4½	— 1½d
Kaduna Syndicate	2/3	— 3d
London Tin	5/3	— 1½d
United Tin	3/4½	+ 1½d
SILVER, LEAD, ZINC		
Broken Hill South	42/6	.....
Burma Mines	2/-	+ 9d
Consol. Zinc	26/3	+ 1/-
Lake George	7/4½	+ 7½d
Mount Isa	31/9xd	+ 3d
New Broken Hill	22/6	.....
North Broken Hill	2½	.....
Rhodesian Broken Hill	10/10½	.....
San Francisco Mines	17/6	.....
Uruwira	2/6	.....
MISCELLANEOUS BASE METALS & COAL		
Amal. Collieries of S.A.	42/6	.....
Associated Manganese	54/-	— 4½d
Cape Asbestos	21/7½	— 4½d
C.P. Manganese	51/10½	— 7½d
Consol. Murchison	25/3	+ 4/7½
Mashaba	3d	.....
Natal Navigation	58/9	+ 1/3
Rhod. Monteleo	1/3	.....
Turner & Newall	65/6	.....
Wankie	12/9	+ 3d
Witbank Colliery	3 1/16	— 1/16
CANADIAN MINES		
Dome	$27½	.....
Hollinger	$23	.....
Hudson Bay Mining	$80½	+ ½
International Nickel	$68	+ ½
Mining Corpn. of Canada	£4½	— ½
Noranda	$119	— 1½
Quemont	£5⅜	— ⅛
Yukon	3/7½	— 1½d
OIL		
Anglo-Iranian	8 1/16	.....
Apex	44/9	— 3d
Attock	35/6	+ 1/1½
Burmah	55/6	— 1½d
Canadian Eagle	28/9	+ 6d
Mexican Eagle	22/4½	.....
Shell (bearer)	95/9	+ 1/4½
Trinidad Leasehold	33/-xd	— 1/-
T.P.D.	22/3	— 9d
Ultramar	30/1½	+ 1/1½

COMPANY NEWS AND VIEWS

Mount Isa Finances its Lead and Copper Properties

The heavy fall in profits of Mount Isa mines during the year ended June 30 last was explained by the directors in their report accompanying the accounts for the year. Basically, it was due to the disastrous fall in the prices of lead and zinc, the effects of which on the company's finances were made worse by the company having to begin financing its own lead production to the final sales in the U.K. on the free metal market after the London Metal Exchange re-opened for sales of lead on October 1. Additionally, copper production commenced in February which meant that the long pipeline had to be filled again before sales could be made, and at the end of the company's financial year none of the copper produced had been sold. The combined effect of financing the lead and copper pipelines at a time when the company was still engaged in heavy expenditure on capital items, which necessitated the provision of a portion of the profits to meet these commitments, severely strained the company's financial resources.

Capital expenditure during the year under review amounted to £2,111,269, although it is anticipated that this will be reduced in the near future as the capital programme is now nearing completion. The company's financial results were discussed in these columns in our issue of November 20. Mr. G. R. Fisher is chairman.

Ayer Hitam Maintains Dividend

A preliminary profit statement issued by Ayer Hitam Tin Dredging showing its financial results to the year ended June 30 last revealed a contraction in taxed profits of £86,485 to £263,212. This sharp decline was cushioned to a considerable extent by the lesser off-take in taxation, and this, together with the smaller amount allocated to reserves, enabled the total dividend distribution to be maintained at 110 per cent per 5s. share on the £180,000 issued capital.

Year to June 30	*Output Tons*	*Working Profit*	*Taxation*	*Net Profit*	*Dividend Distribution*		*To Reserve*
					%	£	
1953	1,273	533,251	270,039	263,212	110	106,650	150,000
1952	1,769	851,062	501,365	349,697	110	103,950	200,000

Production is down in the first three months of the current year at 130½ tons, which compares with 169½ tons produced in the first three months of the year under review. The current year's lower production figure was, however, due to the fact that the company's dredge was shut down for an overhaul from July 29 to October 11 and therefore the figure of 130½ tons, in fact, represents output for the month of July only.

The final dividend of 6d. per share will be paid on January 13 to those registered on December 17. Meeting, London, December 30.

Consolidated Tin Mines of Burma: More From Tribute Ops.

The full report and accounts of the Consolidated Tin Mines of Burma for the year ended March 31 last showed that the tonnage of mixed wolfram and tin concentrates handled during the year was 404 tons compared with 423 tons in the preceding year. Of this tonnage, 261 tons (88 tons) were tribute ore from the company's mines and 143 tons (335 tons) were from ore purchasers.

The directors, in their report, state that the Burma Government has initiated discussions with tin and wolfram owners in lower Burma with a view to the mines being operated jointly with the Government.

The financial results were dealt with in our issue of November 27.

Ribon Valley Maintains Dividend

For the second year in succession Ribon Valley (Nigeria) Tinfields has reduced its production costs. Moreover, this feature was allied to an increase in production by 39 tons to 116 tons, but, unfortunately, the average price received per ton tin metal dropped by £121 per ton, which prevented the company from experiencing a banner year.

Year to Mar. 31	*Output (Tons)*	*Content Sn. %*	*Per Ton tin ore (Conc.) Cost*	*(Metal) Price*	*Ore Reserves* Tons*	*Tin Proceeds*
			£	£		£
1953	116	74.1	494	829	3,069	71,635
1952	77	73.8	542	940	3,161	54,917

*Including property of subsidiary Company - Northern Nigeria (Bauchi) Tin Mine

Although tin revenue showed a worthwhile expansion, the cost of tin winning rose from £19,964 to £29,761, and tin realization charges, including royalty freight etc., jumped from £12,829 to £18,350. These two items formed the major portion of the total mining costs, which were higher by £16,632, thereby taking much of the shine off the financial results. However, the dividend was maintained at 5 per cent per 2s. stock unit on the £131,000 issued capital—albeit with the assistance of a small amount drawn from the carry forward.

Year to Mar. 31	*Gross Revenue*	*Mining Costs**	*Taxation*	*Net Profit*	*Dividend*	*Carry Forward*
	£	£	£	£	%	£
1953	72,142	57,356	4,139	2,451	5	7,253
1952	55,060	41,724	6,400	2,616	5	8,404

* Including tin realization charges, royalty, freight, etc.

During the first seven months of the current year the company's total production stands at 80 tons, which compares with an output of 57 tons produced in the corresponding period in the year under review. Thus the promise of a higher year-end production total should go some distance towards offsetting the lower average tin price and the maintenance of the dividend.

Mr. A. Hedley Williams is chairman. Meeting, London, December 16.

Meru Tin Pays Less

Meru Tin is not recommending the payment of a final dividend for the year ended June 30 last according to company's preliminary profit statement now published. Thus shareholders will have to be content with the interim payment of 2½ per cent paid at the end of January last, which compares with a total distribution of 12½ per cent paid in the preceding year. Untaxed profits were down from £12,246 to £8,587, but provision for tax liability at £457 was immeasurably lighter than the £7,878 provided in the previous year. The company has written off £18,878, of which £5,000 was accounted for by the Malaya suspense account, and these appropriations have turned the forward balance into a debit of £5,803 compared with a credit of £6,448 brought in.

The Report and Accounts will be issued to shareholders on December 9. Meeting, London, December 31.

London and African's Sound Financial Position

The full report and accounts of London and African Mining Trust for the year ended September 30 last shows that the company is in a relatively sound financial position, its surplus current assets and quoted securities at market value amounting to £166,058 against the issued capital of £187,506. Moreover, this surplus ignores the company's holding in Mines Development Syndicate which, the chairman states, has considerable potential value.

In this connection, Mr. W. J. C. Richards, in his review to shareholders said that the Mines Development Syndicate was now negotiating with others who are likely to participate in financing the Nigerian properties recently investigated by the American Smelting and Refining Company who released their option on the properties after having spent $1,770,000 on their examination. This decision was taken, however, when the mines became flooded and at that time there was neither equipment nor power available to cope with it.

The company's financial results were dealt with in our issue of November 13. Meeting, London, December 14.

Some New Union Goldfields Group Results

In last week's issue we dealt with the full report and accounts of New Union Goldfields and stated that several of the companies in the New Union Goldfields group would be dealt with this week.

Below we give short notes on seven of the companies in the group whose reports and accounts dealing with their last complete financial year have now been published. Lt.-Col. R. L. Broad is chairman of the seven companies.

Wit Extensions.—Wit Extensions incurred a loss for the year to June 30 last of £11,147, which included £5,777 in respect of taxation. This tax liability arose chiefly out of a refund received during the year from Jeannette Gold Mines in respect of drilling expenses incurred in previous years on properties included in the Jeannette Company's quotation. Meeting, Johannesburg, December 17.

New Durban Gold and Industrials.—This company's accounts

for the year ended June 30 last showed a loss for the year of £6,263 compared with a profit of £6,346 in the preceding year and, as a result, the forward balance at the company's financial year end was reduced to £4,590 compared with £10,853 brought in. Meeting, Johannesburg, December 15.

New Nigel Estate and Gold Mining Company.—During the year to June 30 last this company returned a net profit of £18,280 compared with £4,709 in the previous year, due mainly to an increase of £13,621 to £20,002 on share dealing profits. The carry forward at the end of June last was £1,917 against £1,845 previously. Meeting, Johannesburg, December 14.

Lydenburg Gold Farms.—The net profit of this company having fallen from £23,522 to £18,095 during the year to June 30 last, the dividend was reduced from 2d. to 1½d. per 1s. 9d. share on the £212,229 issued capital which absorbed £19,167 (£20,222). The carry forward was £30,958 against £27,088 brought in. Meeting, Johannesburg, December 7.

Middlevlei Estate and Gold Mining Co.—Net profit for this company for the year to June 30 last was £7,392 against £8,075 previously. After writing off £2,502 in respect of losses on sales of investments and appropriating £33,669 against depreciation of share holdings, the carry forward was reduced to £771 against £29,508 brought in. Meeting, Johannesburg, December 9.

Witwatersrand Deep.—For the year ended June 30 last Witwatersrand Deep made a profit of £500 compared with a loss of £11,978 the preceding year. The difference between the two year's operations which these figures reflect are mainly accounted for by the fact that during the year ended June 30, 1952, there was a loss of £11,468 on the sale of share investments, whereas in the year under review there was a net profit of £155. Meeting, Johannesburg, December 14.

New Vaal Farms.—New Vaal Farms incurred a loss of £8,733 on operations during the year ended June 30 last, which compares with the loss of £12,246 in the preceding year, thereby increasing the accumulated loss to £14,864. Meeting, Johannesburg, December 22.

Trinidad Leasehold's Higher Payment and Scrip Issue

The full report and accounts of Trinidad Leaseholds, dealing with operations for the year ended June 30 last, feature a higher payment and a scrip issue.

The consolidated net profit for the year, after all charges, including taxation, was £1,774,652 (£1,899,952) which is wholly attributable to the holding company. The sum of £1,000,000 (£1,100,000) was allocated to reserves, and the total distribution of 1s. per 5s. stock unit, free of tax, absorbed £327,890 (£273,242) leaving £426,985 against £335,781 to be carried forward.

The company has also announced a one-for-one scrip issue, for which Treasury consent has been obtained, and which will be made to those registered on November 23. The new ordinary will rank *pari passu* with the old after the final dividend has been paid.

The final dividend will be payable on or after December 23. Mr. S. J. Vos is chairman. Meeting, London, December 17.

Streamline Filters Hit By E.P.L.

Streamline Filters, the well-known manufacturers of filters and separators for oil purification, experienced good conditions during 1952, the trading profit expanding by some £70,000 to £179,571. Expenses were slightly higher but it was the off-take in taxation which prevented the company's net profit figure showing up to much better advantage than it did as the Exchequer took no less than £111,814 against £67,467, of which E.P.L. accounted for as much as £25,500. In addition to the dividend payments totalling 20 per cent, the same as was paid in 1951, the company is also paying a bonus of 5 per cent. The total distribution absorbed a net amount of £13,625 (£10,500), and after allocating £10,625 (£10,104) to reserves, the carry forward was higher at £100,528 compared with £69,281 brought in. The balance sheet position is good and current assets total £403,028 compared with current liabilities of £125,325, giving a net current asset figure of £277,703 which compares with an issued capital of £100,000. The current year's results should be as good as those now under consideration and in the longer run there would appear to be scope for higher distribution as there will be no E.P.L. liabilities after the end of this year.

Mr. C. S. Garland is chairman and managing director. Meeting, London, December 14.

"Australians" Making Steady Progress

The ten Australian gold producers listed in the table below publish their monthly production figures in four-weekly periods rather than in calendar months. This fact is clearly indicated in the table and should be borne in mind as the returns over the year will number 13 instead of the usual 12 as in the case of companies returning figures representing calendar months.

AUSTRALIAN GOLD RETURNS - OCTOBER

Company	4 weeks to November 3		4 weekly period since year-end	Current Financial Year Total to date		Last Financial Year Total to date	
	Tons (000)	Yield (oz.)		Tons (000)	Yield (oz.)	Tons (000)	Yield (oz.)
Boulder Perseverance	10.0	2,676	8	81	19,708	79	18,166
Central Norseman	11.0	4,269	8	94	46,029	99	50,792
Central Victoria	217.5*	686	8	1668*	5,906	1359*	6,959
Golden Horse Shoe	82.0	760	10	774	7,631	756	8,134
G.M's of Kalgoorlie	15.4	4,788	8	120	34,701	105	29,388
Morning Star†	1.3	1,197	8	11	11,756	13	8,450
New Coolgardie	5.4	2,711	8	43	19,973	39	20,530
North Kalgurli	19.4	4,429	11	226	52,476	201	50,577
Sons of Gwalia	8.5	1,694	11	97	21,911	78	19,590
South Kalgurli	8.5	1,921	8	70	13,973	57	12,364

* Cu. yds. dredged
† Work stopped October 30 - November 9

With only two more returns to come before the completion of their financial years, North Kalgurli and Sons of Gwalia appear certain to eclipse last year's total gold production. This happy state of affairs—so far this year at any rate—seems also to be the more general experience as the figures for the cumulative results to date clearly show. However, Central Norseman, Central Victoria, Golden Horse Shoe, and New Coolgardie will all have to do better in the remaining four-weekly periods of the current financial year if they are to match last year's production totals.

Morning Star (G.M.A.)'s cumulative gold production to date is well ahead of the corresponding total achieved in the preceding year and with five more returns to be made before completing its financial year the total gold recovered for the year should noticeably exceed the 12,500 oz. produced during the year to March 31, 1952.

Miscellaneous Gold Producers in October

The table below gives the monthly tonnage treated and gold recovered together with the cumulative totals to date and the corresponding totals recorded a year ago of seven gold producers whose geographical location ranges from New Zealand as in the case of Clutha River, to Tanganyika for Geita Gold. It is hoped to subsequently enlarge this list to include other gold producers who geographical situation does not easily admit of their being included in our other monthly tables containing gold producers situated within well defined geographical boundaries.

MISCELLANEOUS GOLD RETURNS - OCTOBER

Company	October, 1953		Mths. since year end	Current Financial Year Total to date		Last Financial Year Total to date	
	Tons (000)	Yield (oz.)		Tons (000)	Yield (oz.)	Tons (000)	Yield (oz.)
Br. Gu. Consol.	198.9*	1,798	10	1984*	12,384	1305*	14,862
Clutha River	229.0*	335	7†	1561*	3,579	1460*	3,246
Frontino	10.3	4,791	10	97	47,592	99	52,199
Kentan (Geita)	23.0	3,543	4	91	13,546	82	12,420
New Gu. G'flds	3.0	1,490	1	3	1,490	3	2,157
Saudi Arabian‡	7.7	£35,891	9	83	£176,789	90	£128,459
St. John d'El Rey	12.6§	£63,000	10	273	£1,560,084	319	£2,377,316

* Cu. yds. dredged
† Four-weekly period since year end
‡ September output
§ Production for 14 days only due to strike

Clutha River presents an encouraging picture, not so much because of the fact that its cumulative production to date is ahead of that achieved in the corresponding period a year ago—although this is certainly all to the good—but rather because it is one of the few New Zealand gold mining companies still keeping its head above water. St. John d'El Rey, one of the oldest consistently worked mines in the world, has a good deal of leeway to make up if it is to produce comparable results to those achieved in the preceding year. However, the same cannot be said of Geita Gold Mining, the young Tanganyika gold produced whose gold production at the end of four months of the current year gives promise of a much higher end-year total than in the preceding year. Saudi Arabian milled less than it has done for a very long time, but the monthly profit figure announced must be something of a record. In any event, it will surpass last year's profit as this amounted to only some £155,000. The New Guinea Goldfields monthly figure is a trifle disconcerting but it is too early yet to say if the October return is indicative of what can be expected in the current year or merely that it was a bad month—something which happens to the best regulated gold mining companies.

October Tin Returns

Of the 45 tin and columbite producers whose production figures for October are given in the table below together with their cumulative output totals to date and the output achieved in the corresponding period a year ago, Renong Tin Dredging appears particularly interesting.

With only four months of its current financial year completed it has already produced over 200 tons more than in the same period in the preceding year. So far production is running at the rate of approximately 860 tons in a full year but this would appear to be too optimistic an assessment of what can be expected as the final year-end total. Indeed, as the chairman, Sir John Hay, said in his statement accompanying the accounts for the year ended June 30 last, the returns during the current year are exceptional and temporary, being due to the Rasa dredge (No. 2 Dredge) passing through an exceptionally rich virgin belt. Nevertheless, output for the year is almost bound to be in excess of the 333 tons produced during the year to June 30 last which, taken in conjunction with the fact that the company has been able to keep its operating costs down remarkably well, should go some distance towards cushioning the impact of the lowered average tin price.

In any event the company is sound financially and as the total distribution for the year ended June 30 last required only a net amount of £28,876 shareholders may not experience any considerable reduction in their dividend income during the current year, particularly so as the company is not averse to drawing on its reserves to give shareholders a reasonable return on their investment.

All the columbite producers in the table below show improvement over the preceding year's figures while Beralt, the important wolfram producer whose mines are situated in Portugal, has increased its output by about 40 tons over the corresponding period in the preceding year.

OCTOBER TIN OUTPUT IN TONS OF TIN CONCENTRATES

Company	Oct.	Months since year end	Financial Year to Date		Company	Oct.	Months since year end	Financial Year to Date	
			This	Last				This	Last
EASTERN					**NIGERIA**				
Ampat	114½	10	1045½	781	Bisichi	51	10	421	462
Bangrin	68½	10	610½	496	Bisichi‡	25	10	159	130
Batu S.	21½	1	21½	24	Ex-Lands	69	10	509	461
Berjuntai	42	6	283½	467	Filani	5	10	56	70
Kampong	32½	7	176½	187	Jantar	16	1	16	20
Kamunting	118½	7	766	1270	Jantar‡	18	1	18	18
Kinta K.	29½	7	173	79	Jos Tin Area	16	3	42½	41½
Kinta T.	31½	10	282½	243½	Kaduna P.	12	10	98½	67
Klang River	54½	7	294½	212	Kaduna S.	34	10	298	216
Kuala K.	159	7	1100½	1166	Keffi Tin	12	7	25½	161
Kuchai	35½	1	35½	54	Keffi Tin‡	37	7	78½	—
Larut	83½	10	492½	617	Naraguta Ex.	10½	10	64½	74
Lower Perak	142½	6	484½	488	Naraguta K.	25½	10	136½	116
Malaysiam	15	7	61½	40	Naraguta T.	23½	10	198	241
Pahang	220	4	660	660	Naraguta T.‡	10	10	50	41
Rahman	35	4	162½	156	Ribon	17	7	80	57
Rantau	78½	4	227½	301	Rukuba	3½	7	16½	13
Rawang Conc.	75	7	450	366	S. Bukeru	10	10	65½	49
Rawang Tin*	14½	7	149½	466	Tinfields of Nig.	2½	7	17½	12
Renong	58½	4	287½	86	U. Tin	8	4	35	48
S. Kinta	484½	7	2585½	2706	U. Tin‡	0.15	4	1.07	—
Taiping Cons.†	83½	10	83½	564					
Tambah	16	10	90½	117					
Tanjong Tin	42½	10	665½	848	**MISC.**				
Tongkah	47½	4	144	283	Beralt Tin§	214	7	1330	1292
					Beralt Tin	10	7	57	79
NIGERIA					Geevor	60	7	388	330
Amal. Tin	424	7	2298	2435	S. Crofty	52½	10	453½	381
Amal. Tin‡	68½	7	392	271	S. Crofty‡	0.195	10	0.195	1.5

* Amang output only. † Dredge working again in Kundang Tin Area—output given for Sept. 15 - Oct. 31 ‡ Columbite § Wolfram.

Coal Producers Show Mixed Results in October

In the table which follows we publish the monthly production returns for October of 16 of the leading coal producers in Southern Africa together with their cumulative output totals to date and the corresponding totals achieved during the same period in the preceding year.

With 10 months of the companies' financial year already passed interest, naturally, tends to centre around their cumulative totals to date rather than on the latest monthly production figure. However, it should be noted that the October returns for Vierfontein, which came into production in May last, was the best to date. This comment also applies to two of the older established companies, New Clydesadale and Witbank.

Viewing the cumulative totals to date it can be seen that not all of the companies will better their preceding year's figures. But Wankie Colliery, the important Southern Rhodesian producer now under the control of the Anglo American Corporation of South Africa, seems certain to achieve this for both coal and coke. Vryheid Coronation is another coal and coke producer whose figures show an improvement, particularly for coke, the output of which during the first ten months of the current year has gone ahead by leaps and bounds, whilst maintaining coal production at the same rate as in the previous year. Other companies whose end year figures should show up to advantage include Blespok, Springbok and Van Dyks Drift.

COAL OUTPUTS FOR OCTOBER

Company	October	Month Since Year End	Cumulative Totals	
			This year to date	Last year to date
Amal. Coll. of S.A.	632,893	10	6,281,991	6,579,321
Apex	70,462	10	798,695	829,727
Blesbok	53,067	10	521,628	474,989
Coronation	94,074	10	896,171	917,256
Dundee	37,228	10	362,831	390,272
Natal Navigation	121,751	10	1,132,030	1,204,059
New Clydesdale	72,529	10	592,126	306,719
New Largo†	53,839	10	471,087	—
S.A. Coal Estates	128,719	10	1,392,431	1,376,224
Springbok	65,526	10	715,564	701,895
Tweenfontein	108,051	10	1,067,436	1,089,907
Van Dyks Drift	41,660	10	474,743	455,183
Vierfontein‡	50,029	10	230,682	—
Vryheid Cor.	44,851	10	427,032	425,324
" " *	36,192	10	363,140	230,945
Wankie Colliery	212,874	10	2,104,784	2,042,257
" " *	12,315	10	126,619	97,889
Witbank	147,063	10	1,330,570	1,202,741

* Coke † In production since January 1953 ‡ In production since May 1953

Oil Results in October

If the ten oil producers whose monthly production returns for October are published in the table below, together with their cumulative output totals to date and corresponding production totals achieved in the corresponding period of the previous year, are any guide as to the general state of the world's oil producers, it would appear that the industry is still expanding.

OIL OUTPUTS FOR OCTOBER

Company	October (in tons)	Months Since Year End	Cumulative (in tons)	
			This year to date	Last year to date
Anglo Ecudorian	26,716	7	183,337	169,743
Apex Trinidad	37,329	1	37,329	37,826
Attock Oil*	39,995	9	120,888	101,921
Kern Oilfields	27,855	5	139,231	128,235
Kuwait Oil†	3,991,791	10	35,259,167	30,837,199
Lobitos Oil	40,750	10	387,051	367,868
Trinidad Central	9,090	10	81,033	60,478
Trinidad Leaseholds	76,734	4	301,250	292,916
Trinidad Petroleum	40,115	3	118,989	125,560
Ultramar Oil‡	114,258	10	1,060,641	1,096,070

Note:- 1 ton taken to equal seven barrels
* September quarter † Figures are for month of September
‡ Output figures are for SAP Las Mercedes in which Ultramar holds a 50 per cent interest

Of these ten companies, the smallest, Trinidad Central, provides interesting reading. For the last three years the company's production has been consistently rising. In 1951 its monthly production totals varied between 5,000 and 6,000 tons, but in the current year its monthly output has never been below 7,000 tons (excluding February), while its output for October—a record—topped the 9,000 ton mark. Lobitos has a similar history over the past three years and although its October output figure did not reach record heights it increased the number of months the company had bettered 40,000 tons to three—all of them in the current year—a fact reflected in its cumulative output total to date, which shows that the company has produced some 20,000 tons more than in the corresponding period of the preceding year.

The October production figure for Trinidad Leaseholds was the best for a very long time, and that announced by Kuwait of 3,991,791 tons has not been bettered for as long as we have been keeping records. Indeed, the improvement in production during the current year compared with a year ago is nearly 4,500,000 tons.

The Issue Before South Bukeru Shareholders

The circular sent last week to shareholders of South Bukeru Areas by the requisitionists of the Extraordinary General Meeting to be held on December 8 (see *M.J.* Nov. 20, page 601) has proved in the event to contain somewhat similar proposals to those which were placed before the shareholders of Naraguta Tin and rejected by them a few weeks ago. The requisitionists (who, as in the case of Naraguta Tin, represent interests associated with the Parrish group of companies) are calling for the

removal *en bloc* of the present directors (who, incidentally, are the same as those on the board of Naraguta Tin) and, in brief, are recommending (1) an early cash distribution from the company's accumulated reserves and (2) an endeavour to raise the mine's output of tin and columbite.

As regards the first proposal, South Bukeru has over many years maintained an exceptionally steady dividend payment record and it may well be that inroads may have to be made on the company's reserves if this record is to be maintained during the difficult period which now seems to be ahead of the tin industry. At the same time quite a number of shareholders, aside from those associated with the requisitionists, seem to feel that there is a case for a partial return of capital in view of the high liquidity of the company (net liquid assets exceed issued capital by about 50 per cent).

A shareholders' committee (which is itself opposed to the requisitionists' resolutions but believes that a partial return of capital is now justified) has recently had discussions with the board, as the result of which the latter have agreed to propose to shareholders a return of capital to the extent of 1s. per share (50 per cent). This proposal would, of course, need to be the subject of a resolution at a further Extraordinary General Meeting, following on that called for next Wednesday to consider the requisitionists' resolutions.

As regards the requisitionists' proposals for raising output, it should be borne in mind that the properties owned by the company have now been worked for over 40 years and that even before the present company took over the property in 1929 the ore content had been much depleted, and that much of the company's mining operations have had to be conducted in partially worked ground. The prospect of discovering valuable new deposits at this stage must therefore appear very uncertain. In the light of the present outlook for tin, there is a further point in this connection, which shareholders might do well to consider carefully. If the present International Tin Conference at Geneva works out any scheme of regulation of output, this must inevitably mean that existing producers will be required to restrict their output to a quota based on a percentage of average production over recent years. This would in any case prevent the company making any increase in its average yearly tin output and in this connection it must be pointed out that the company's output for the first 10 months of 1953 is already 30 per cent up on the corresponding periods of 1951 and 1952.

In so far as the requisitionists may be thinking in terms of increasing the property's columbite output, rather than tin, it should be borne in mind that the company has only been producing quite small quantities of columbite (an average of less than three tons in each of the past three years). Moreover, the most recent information from the company's general manager on the spot is that there are no grounds for thinking that production can be materially increased from the Forum River Valley, which is the section of the property where columbite occurs, the whole of this area having been extensively worked in the past. It may be however that the requisitionists have in mind the experience of some Nigerian producers that ground below the pay limit for tin only may be profitably worked if it also carries even a low columbite content.

Incidentally the figures in the requisitionists' circular which suggest that South Bukeru may be an inefficient producer because its costs per ton of tin concentrates are among the highest in Nigeria, make no allowance for the fact that this may well be entirely due to the low average grade of ground being worked, or, as in many cases, reworked. A more accurate index of relative mining efficiency would have been comparative figures of costs per cubic yard of ground treated, and perhaps the board will be moved to publish these figures in rebuttal if they are available.

All in all little seems likely to be gained at this late stage in the company's history by efforts to raise the rate of production, and as all parties, including the present board, now appear to be agreed on the principle of a partial capital repayment, shareholders may well question the wisdom of removing the present directors who if they have been at fault, would seem to have erred on the side of caution.

Company Shorts

Mawchi Mines Freed.—Mawchi Mines, which has been under the control of the Karen Rebels since 1948, has now been taken over by the military forces of the Burmese Government. Reports reaching this country state that the property was untouched by the fighting and that the two hydro-electric power stations and the telephone exchange were still in working order. Further, the mine equipment was in good condition and also the British staff were well and unharmed. It appears that the rebels merely seized any ore which had already been mined and had made no attempt to work the mine. These messages arrived in this country after the publication of the company's report for the year ended March 31 last which, because of the conditions governing communications with Burma, did not contain the accounts. Assuming that the mine can once more be worked under reasonable conditions, the directors believe it would become one of Burma's principal mining undertakings. Mr. George P. Joseph is chairman. Meeting, London, December 17.

New Central Wits. Earn Less.—The profit and loss account of New Central Witwatersrand Areas for the year ended June 30 last showed a net profit of £5,650 compared with £6,647 in the preceding year.

During the year the company disposed of its holding in Rand Leases and utilized the proceeds to acquire an investment in Randfontein, the potentially big producer of uranium. Mr. M. W. Rush is chairman.

Dominion Reefs to Produce Uranium. — Confirmation was forthcoming last week that Dominion Reefs (Klerksdorp) is to erect a plant for the extraction of uranium from accumulated and current slimes and is expected to be in operation during 1955. The cost of the plant, which is estimated at approximately £2,000,000, is being financed from British and American sources. The price payable for uranium, it is stated, will be related to the cost of production on a basis which will ensure redemption of the entire cost of the plant, plus interest, during the period of production and will provide a satisfactory margin of profit.

Klerksdorp Consolidated Investigates its Occurrence of Uranium.—Klerksdorp Consolidated Goldfields has announced that written authority has been granted by the Minister of Mines to investigate the occurrence of uranium on the company's property.

Lydenburg Estates in 1953. — Lydenburg Estates, whose principal investments are Welkom, President Brand, President Steyn, Virginia O.F.S., and Merriespruit, all of which are in the Orange Free State, showed a profit on its operations for the year ended June 30 last of £2,931, compared with £6,033 in the preceding year. Mr. A. Comar Wilson is chairman. Meeting, London, December 15.

S.A. Coal Estates (Witbank) Maintain Dividend. — South African Coal Estates (Witbank) increased their sales output during the year to June 30 last by 1,647 tons to 1,660,691 tons, a fact which had its counterpart in the profit and loss account where taxed profits were shown to be £222,438, compared with £211,018 in the preceding year. The dividend distribution was maintained at the rate of 4s. per £1 share on the £1,000,000 issued capital and required £200,000. The carry forward at the financial year end was £100,880, compared with £87,327 brought in. Mr. T. Coulter is chairman.

Tanganyika Central Gold Mines.—The gross revenue of Tanganyika Central Gold Mines for the year ended June 30 last totalled £1,399, but expenses amounted to £3,235, leaving an adverse balance of £1,836. The debit balance carried forward was £106,922. Mr. Geo. Mackenzie is chairman. Meeting, Johannesburg, December 18.

Tanganyika Diamond and Gold Development Co.—During the year to June 30 last this company incurred a loss on its operations of £3,160. The forward balance at the financial year end was £3,945, compared with £12,792 brought in. Mr. E. J. Donaldson is chairman. Meeting, Johannesburg, December 11.

Rukuba Tin Reports Small Loss.—Rukuba Tin Mines, the Nigerian tin producer, in a preliminary profit statement showing results for the year ended March 31 last, reported that a loss was incurred on the year's operation of £1,789, which compares with a profit of £1,789 in the preceding year. However, this debit figure may stand in need of some revision as a quantity of mixed concentrate was also produced during the year and pending treatment no amount in respect of these concentrates was credited to the accounts for the year under review. The carry forward at the company's financial year end showed a debit of £1,800 compared with a debit of £798 in the preceding year. Meeting, London, December 30.

Tin Fields of Nigeria Shows Loss on the Year's Operation.—Tin Fields of Nigeria, which produced 24¼ tons tin ore (same) during the year ended March 31 last, has announced, in a preliminary profit statement, a loss on the year's operations of £4,004 compared with the loss in the preceding year of £829. The forward balance at the company's financial year end was £909 compared with £378 brought in. The loss incurred on the year's operations was met by crediting the profit and loss account with £1,500 from general reserve and £2,422 transferred from contingencies reserve, together with a tax rebate of £826. Meeting, London, December 30.

Take-over Bid for Lahat.—The Lahat Mines has announced that an offer has been received from a firm of brokers, acting on behalf of clients, to purchase all the issued shares in the capital of the company at 11s. per share. The offer, which is free of all expenses to the shareholder, is conditional upon acceptance of not less than 90 per cent of the shares of the company and will remain open until December 14. This offer is approximately 1s. to 2s. higher than shareholders would have received in the event of the company's liquidation.

Puket Tin's Capital Reduction.—Puket Tin Dredging has announced that it has decided to recommend that the capital of the company be reduced by returning, to the holders of the 1,000,000 5s. shares issued, 1s. 6d. per share as the funds which this capital return represents are in excess of the company's present requirements. A circular setting out the board's proposals will be sent to shareholders shortly.

Temoh Tin to Return 10s.—Temoh Tin Dredging has announced that it will convene an extraordinary general meeting early in the New Year to submit a special resolution for the return of 10s. per £1 stock unit out of funds no longer required in the business. The directors state that they have had under consideration for some time the recommendation of a return of capital to stockholders and since the preparation of the accounts for the year ended June 30 last, the company has received full and final settlement of its war damage claim.

The company's results for the year ended June 30, 1953, were discussed in these columns in our issue of November 20.

Barclays D. C. and O. Pays Same.—With an unchanged final dividend payment of 4 per cent on the "A" stock and "B" shares, Barclays Bank (Dominion Colonial and Overseas) are maintaining the total distribution for the year to September 30 last at 8 per cent.

The net profit for the year, after providing for all charges, including taxation, was slightly lower at £869,431 compared with £879,888 in the preceding year. The sum of £300,000 was again transferred to the reserve fund which fund was further increased to £8,000,000 by the transfer of £200,000 from inner reserve, being provision for contingencies no longer required. The total dividend distribution absorbed a net amount of £408,182, and after allocating £150,000 to the premises reserve account, the balance carried forward was £252,354 against £241,105 brought in. Mr. J. S. Crossley is chairman.

B.O.M.A. in 1953.—The report and accounts of the British Overseas Mining Association have now been issued and state that during the year 12 operating companies in category A became new members of the Association and six companies resigned. The total membership was thus increased to 112 members.

Reference is also made to recruitment and training of technical staff and Mr. Robert Walker, President, said that in response to suggestions that the number of technologists now being trained for posts in the overseas mining industry might fall short of the industry's future requirements, the Association appointed a sub-committee to consider this matter in conjunction with the Institution of Mining and Metallurgy. Meeting, London, December 18.

Metal and Mineral Trades

MACHINERY & EQUIPMENT DIRECTORY

Buyers will find the addresses of the companies listed below in the advertisement pages of our recent issues. Alternatively, enquiries may be addressed to *The Mining Journal*, 15 Wilson Street, London, E.C.2. Phone: MONarch 2567.

AGITATORS
Denver Equipment Co. Ltd.
Head Wrightson & Co. Ltd.
Wilfley Mining Machinery Co. Ltd.

AIRCRAFT
The Bristol Aeroplane Co. Ltd.

ALTERNATORS — TURBO
Richardsons Westgarth (H'pool) Ltd.

ALUMINIUM FABRICATORS
T. I. Aluminium Ltd.

BALL MILLS & LINERS
Fraser & Chalmers Eng'g Wks.
Head Wrightson & Co. Ltd.

BATTERIES — ELECTRIC
Britannia Batteries Ltd.

BELTING — RUBBER & FIRE RESISTANT
British Tyre & Rubber Co. Ltd.
Dominion Rubber Co. Ltd.
Goodyear Tyre and Rubber Co. (G.B.) Ltd.
Rubber Improvement Ltd.

BOILERS
Richardsons Westgarth (H'pool) Ltd.
Ward (Thos. W.) Ltd.

BOOTS — MINER'S SAFETY
Wilkins & Denton Ltd.

BOREHOLE & DRILLING CONTRACTORS
Associated Drilling & Supply Co. (Overseas) Ltd.
Craelius Co. Ltd.
Thom (John) Ltd.

BRAKE & CLUTCH LININGS
Small & Parkes Ltd.

CABLES
British Insulated Callender's Cables Ltd.

CABLEWAYS & ROPEWAYS
Ceretti & Tanfani Ropeway Co. Ltd.

CALCINING PLANT
Head Wrightson & Co. Ltd.
Wilfley Mining Machinery Co. Ltd.

CASTINGS
Butterley Co. Ltd.
Hadfields Ltd.

CEMENTATION
Cementation Co. Ltd.

CHEMICALS
I.C.I. (Gen. Chem. Div.)

CLASSIFIERS
Denver Equipment Co. Ltd.
Head Wrightson & Co. Ltd.
Holman Bros. Ltd.

CLEANING RAGS
Austin (E.) & Sons (London) Ltd.

CLUTCHES — FRICTION
British Belting & Asbestos Ltd.
Small & Parkes Ltd.
Wigglesworth (F.) & Co. Ltd.

COAL & COKE HANDLING PLANT
The Birtley Co. Ltd.
Head Wrightson & Co. Ltd.

COAL CUTTERS
Joy-Sullivan Ltd.

COAL WASHING PLANT
The Birtley Co. Ltd.
Fraser & Chalmers Eng'g Wks.
Head Wrightson & Co. Ltd.

COMPRESSORS — AIR
Atlas Diesel Co., Ltd.
British Thomson-Houston Co. Ltd.
Climax Rock Drill & Eng'g Wks. Ltd.
Consolidated Pneumatic Tool Co. Ltd.
English Electric Co. Ltd.
Holman Bros. Ltd.
Metropolitan-Vickers Electrical Co. Ltd.
Ward (Thos. W.) Ltd.

CONCENTRATING TABLES
Davies Magnet Works Ltd.
Fraser & Chalmers Eng'g Wks.
Holman Bros. Ltd.
Knapp & Bates Ltd.
Wilfley Mining Machinery Co. Ltd.

CONCRETE MIXERS
Ransomes & Rapier Ltd.

CONVEYORS & ELEVATORS
Fraser & Chalmers Eng'g Wks.
Head Wrightson & Co. Ltd.
Wood (Hugh) & Co. Ltd.

CRANES
Butterley Co. Ltd.
Ward (Thos. W.) Ltd.

CRAWLER TRACTORS
Abelson & Co. (Engineers) Ltd.
Marshall Sons & Co. Ltd.

CRUSHERS — JAW
Baxter (W. H.) Ltd.
Fraser & Chalmers Eng'g Wks.
Hadfields Ltd.
Head Wrightson & Co. Ltd.
Holman Bros. Ltd.

CRUSHERS — GYRATORY
Hadfields Ltd.

CRUSHING ROLLS
Hadfields Ltd.
Head Wrightson & Co. Ltd.

CYANIDE PLANTS
Denver Equipment Co. Ltd.
Fraser & Chalmers Eng'g Wks.
Head Wrightson & Co. Ltd.
Knapp & Bates Ltd.

DIAMONDS — INDUSTRIAL
Smit (J. K.) & Sons Ltd.
Triefus Ltd.
Van Moppes (L. M.) & Sons Ltd.
Wolverhampton Diamond Die & Tool Co. Ltd.

DREDGE BUCKETS
Hadfields Ltd.

DREDGES
Ruston Bucyrus Ltd.

DRILL BITS — DETACHABLE
Rip Bits Ltd.
Holman Bros. Ltd.

DRILL BITS — DIAMOND
Craelius Co. Ltd.
Smit (J. K.) & Sons Ltd.
Triefus Ltd.
Van Moppes (L. M.) & Sons Ltd.

DRILL RIGS
Joy-Sullivan Ltd.
Ruston Bucyrus Ltd.
Siemens-Schuckert (G.B.) Ltd.

DRILL RODS
Holman Bros. Ltd.
Rip Bits Ltd.
Wood (Hugh) & Co. Ltd.

DRILL SHARPENERS
Holman Bros. Ltd.

DRILL STEEL
Consolidated Pneumatic Tool Co. Ltd.
Hadfields Ltd.

DRILLS — DIAMOND & CORE
Consolidated Pneumatic Tool Co. Ltd.
Craelius Co. Ltd.
Joy-Sullivan Ltd.

DRILLS — PROSPECTING
Associated Drilling & Supply Co. (Overseas) Ltd.
Ruston Bucyrus Ltd.

DRILLS — ROCK
Atlas Diesel Co., Ltd.
Climax Rock Drill & Eng'g Wks. Ltd.
Consolidated Pneumatic Tool Co. Ltd.
Dollery & Palmer Ltd.
Holman Bros. Ltd.
Siemens-Schuckert (G.B.) Ltd.
Wood (Hugh) & Co. Ltd.

DUST COLLECTING PLANT
Howden (James) & Co. (Land) Ltd.

EARTH MOVING EQUIPMENT
Abelson & Co. (Engineers) Ltd.
Birtley Co. Ltd.
Blackwood Hodge (J.) & Co. Ltd.
Marshall Sons & Co. Ltd.
Premier Plant & Hire Co. Ltd.
Ward (Thos. W.) Ltd.

ELECTRIC MOTOR & CONTROL GEAR
British Thomson-Houston Co. Ltd.
English Electric Co. Ltd.
General Electric Co. Ltd.
Metropolitan-Vickers Electrical Co. Ltd.

ELECTRICAL SWITCHGEAR
British Thomson-Houston Co. Ltd.
English Electric Co. Ltd.
General Electric Co. Ltd.
Metropolitan-Vickers Electrical Co. Ltd.
Wood (Hugh) & Co. Ltd.

ELECTRICAL PRECIPITATION
Lodge Cottrell Ltd.

EXCAVATORS
Blackwood Hodge (J.) & Co. Ltd.
Olding (Jack) & Co. Ltd.
Premier Plant and Hire Co. Ltd.
Ransomes & Rapier Ltd.
Ruston Bucyrus Ltd.

EXPLOSIVES — BLASTING
I.C.I. (Nobel Division)

EXTRUSIONS — ALUMINIUM
Southern Forge Ltd.

FANS
Aerex Ltd.
Howden (James) & Co. (Land) Ltd.

FILTERS
Denver Equipment Co. Ltd.

FILTERS — LUBRICATING OILS
Stream-Line Filters Ltd.
Tecalemit Ltd.

FILTERS — SWITCH & TRANSFORMER OIL
Stream-Line Filters Ltd.

FIRE EXTINGUISHERS
Nu-Swift Ltd.

FIRST AID EQUIPMENT
Cuxon Gerrard & Co. Ltd.

FLEXIBLE JOINTS
The Unicone Co. Ltd.

FLOTATION EQUIPMENT
Birtley Co. Ltd.
Denver Equipment Co. Ltd.
Fraser & Chalmers Eng'g Wks.
Knapp & Bates Ltd.

FLOTATION REAGENTS
I.C.I. (Gen. Chem. Div.)

FORGINGS — ALUMINIUM
Southern Forge Ltd.

FOUNDATIONS
Cementation Co. Ltd.

GEOPHYSICAL INSTRUMENTS
Hilger & Watts Ltd.

GEOPHYSICAL & GEOLOGICAL SURVEYS
Associated Drilling & Supply Co. (Overseas) Ltd.
Craelius Co. Ltd.
Thom (John) Ltd.

GRINDING PANS
Fraser & Chalmers Eng'g Wks.
Holman Bros. Ltd.

HAULAGE GEAR
Austin Hopkinson & Co. Ltd.
Holman Bros. Ltd.
Metropolitan-Vickers Electrical Co. Ltd.

HELMETS
Helmets Ltd.
Malcolm Campbell (Plastics) Ltd.

HEADGEARS
Head Wrightson & Co. Ltd.

HOISTS
Austin Hopkinson & Co. Ltd.
Fraser & Chalmers Eng'g Wks.
Holman Bros. Ltd.

HOSE — RUBBER
British Tyre & Rubber Co. Ltd.
Dominion Rubber Co. Ltd.
Goodyear Tyre & Rubber Co. (G.B.) Ltd.

LAMPS
Metropolitan-Vickers Electrical Co. Ltd.

LOCOMOTIVES — DIESEL
Hill (C. M.) & Co. Ltd.
Hunslet Engine Co. Ltd.
North British Locomotive Co. Ltd.
Ruston & Hornsby Ltd.
Wood (Hugh) & Co. Ltd.

LOCOMOTIVES — ELECTRIC
English Electric Co. Ltd.
British Thomson-Houston Co. Ltd.
Metropolitan-Vickers Electrical Co. Ltd.

LOCOMOTIVES — STEAM
Hill (C. M.) & Co. Ltd.
Hunslet Engine Co. Ltd.
North British Locomotive Co. Ltd.
Ruston & Hornsby Ltd.

LUBRICATION — MECHANICAL
Tecalemit Ltd.

MAGNETIC SEPARATORS
Davies Magnet Works Ltd.
Rapid Magnetic Machines Ltd.

MINE CARS
Butterley Co. Ltd.
Hill (C. M.) & Co. Ltd.
Hunslet Engine Co. Ltd.

MINE CAR — WHEELS & AXLES
Hadfields Ltd.
Wild (A. G.) Ltd.

PICKS — PNEUMATIC
Consolidated Pneumatic Tool Co. Ltd.
Dollery & Palmer Ltd.
Holman Bros. Ltd.
Wood (Hugh) & Co. Ltd.

PIT PROP EXTRACTORS
Wild (A. G.) Ltd.

PLANT — HIRE
Abelson & Co. (Engineers) Ltd.
Premier Plant & Hire Co. Ltd.
Ward (Thos. W.) Ltd.

PUMPING EQUIPMENT
Comet Pump & Eng'g Co. Ltd.
Fraser & Chalmers Eng'g Wks.
Holman Bros. Ltd.
Sigmund Pumps Ltd.
Ward (Thos. W.) Ltd.

PUMPS — CENTRIFUGAL
Comet Pump & Eng'g Co. Ltd.
Fraser & Chalmers Eng'g Wks.
Ward (Thos. W.) Ltd.

PUMPS — GRAVEL
Consolidated Pneumatic Tool Co. Ltd.
Denver Equipment Co. Ltd.
Ruston Bucyrus Ltd.

PUMPS — SAND
Denver Equipment Co. Ltd.
Fraser & Chalmers Eng'g Wks.
Wilfley Mining Machinery Co. Ltd.

PUMPS — SINKING
Thom (John) Ltd.

RAILWAY PLANT & EQUIPMENT
Ward (Thos. W.) Ltd.

RESPIRATORS
Siebe Gorman & Co. Ltd.

RUBBER PRODUCTS
British Tyre & Rubber Co. Ltd.
Dominion Rubber Co. Ltd.
Goodyear Tyre & Rubber Co. (G.B.) Ltd.
Rubber Improvement Ltd.

SAFETY EQUIPMENT
Malcolm Campbell (Plastics) Ltd.
Safety Products Ltd.
Siebe Gorman & Co. Ltd.

SCRAP SHEARS
Morrison Marshall & Hill Ltd.

SCRAPER HAULAGE
Austin Hopkinson & Co. Ltd.
Holman Bros. Ltd.
Wood (Hugh) & Co. Ltd.

SCRAPER LOADERS
Joy-Sullivan Ltd.

SCREENING PLANT
Birtley Co. Ltd.
Davies Magnet Wks. Ltd.
Fraser & Chalmers Eng'g Wks.
Head Wrightson & Co. Ltd.

SHAFT SINKING
Cementation Co. Ltd.

SHOVEL LOADERS
Joy-Sullivan Ltd.

STAMP BATTERIES
Head Wrightson & Co. Ltd.

SURVEYING INSTRUMENTS
Hilger & Watts Ltd.

THICKENERS
Denver Equipment Co. Ltd.

TIMBER PRESERVATIVES
Hicksons Timber Impregnation Co. (G.B.) Ltd.

TRANSFORMERS
British Thomson-Houston Co. Ltd.
English Electric Co. Ltd.
General Electric Co. Ltd.
Metropolitan-Vickers Electrical Co. Ltd.

TUBE BENDING MACHINES
Chamberlain Industries Ltd.

TUBE MILLS
Head Wrightson & Co. Ltd.
Wilfley Mining Machinery Co. Ltd.

TURBINES — STEAM
Richardsons Westgarth (H'pool) Ltd.

VENTILATING FANS
Howden (James) & Co. (Land) Ltd.

VEE-ROPE DRIVES
Wigglesworth (F.) & Co. Ltd.

WAGONS
Butterley Co. Ltd.
Head Wrightson & Co. Ltd.

WATER SUPPLY EQUIPMENT
Associated Drilling & Supply Co. (Overseas) Ltd.
Thom (John) Ltd.

WELDING
Cementation Co. Ltd.

WELDING ELECTRODES
Metropolitan-Vickers Electrical Co. Ltd.

WELDING EQUIPMENT
British Insulated Callender's Cables Ltd.
English Electric Co. Ltd.
Metropolitan-Vickers Electrical Co. Ltd.
Siemens-Schuckert (G.B.) Ltd.

WIRE ROPE & ACCESSORIES
British Ropes Ltd.

WINDING EQUIPMENT — ELECTRIC
British Thomson-Houston Co. Ltd.
English Electric Co. Ltd.
Fraser & Chalmers Eng'g Wks.
Metropolitan-Vickers Electrical Co. Ltd.

Published by The Mining Journal Ltd., 15 Wilson Street, Moorgate, London, E.C.2, and printed by Washburn & Sons Ltd., 25-27 Queens Road, Southend-on-Sea, Essex. Registered as a Newspaper.